Commercial Fisheries Abstracts

a monthly summary of important developments for the fishery industries

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FISH AND WILDLIFE SERVICE

JOHN L. FARLEY, Director

Commercial Fisheries Abstracts

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The abstracts in this leaflet may be left in their present form; but it is suggested that to make the most efficient use of them, they be cut out on the lines designated and filed by the number in the upper left-hand corner of each. For a full description of this filing system see "Fishery Technological Abstract Card System" by Maurice E. Stansby and K. L. Osterhaug, Fishery Leaflet No. 232, obtainable free by request from Fish and Wildlife Service, Washington 25, D. C.

In addition to the regular abstracts, there is included a bibliography of references of secondary importance (without abstracts). These may be cut off on the lines designated and pasted on standard 3 x 5-inch cards for filing.

Following is a brief outline of this filing system. The numbers apply to the first digit appearing on each card. For the meaning of subsequent digits, please see the above described leaflet.

0	General and theoretical	5	Vitamins
1	Fish by species	6	Fishery byproducts
2	Fresh fish	7	Analytical Methods
3	Preserved fish	8	Composition
4	Oils	9	Miscellaneous

Issued with the approval of the Bureau of the Budget, December 29, 1953

3.238 MOISTURE LOSS IN FROZEN SHRIMP

Klein, Marion; Simerl, L. E.; and Adams, Ernest
Modern Packaging 27, No. 5, 139-142, 195-196 (January, 1954)

The conclusions reached in this study are listed as follows:

1. Unglazed shrimp can be packaged successfully for 21 months' storage at 0 deg. F. in a high-gloss waxed carton with a satisfactory overwrap. Glazing is not necessary for protection.

2. A waxed-paper overwrap was equal to the cellophane overwrap from a protective standpoint. The cellophane overwraps were badly damaged during shipment of finished packages, whereas the waxed-paper wraps withstood shipment without damage.

3. Taste testers could not distinguish between glazed and unglazed shrimp from overwrapped packages. These shrimp were tender and juicy, with good flavor; however, there was a slight loss of sweetness at 12 months. Glazed and unglazed shrimp from packages without overwrap were slightly tough, with no off-flavor. The texture change appeared to be the principal adverse factor resulting from loss of moisture.

4. Elimination of glazing reduced the defrosting time of a 5-lb. frozen shrimp block approximately 36 to 55% (under cold running water).

5. The shipping weight of a corrugated fibreboard box containing ten 5-lb. packages of frozen shrimp was reduced 15 lbs. (approximately 21%) by elmination of the glazing process.

6. Glazed shrimp, packaged without an overwrap, showed high weight losses, disappearance of ice glaze and desiccation of surface shrimp.

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3.238 LET THE PACKAGE DESIGN SELL FROZEN SEA FOODS

Nash, Jim
Frosted Food Field XVIII, No. 4, 5, 41 (April, 1954)

The author states that few frozen fish packages today meet the standards of good merchandising. Package design is of prime importance when it is considered that frozen seafoods must compete with each other, brand by brand and item by item. They must also compete with other products, such as frozen meat and poultry.

Because frozen seafoods may be marketed in so many ways--raw, prepared for cooking but not cooked, and fully prepared and cooked--it is essential that the package clearly describe its contents. The kind of seafood, of course, must also be specified. This information must be so clear and bold on the package that the consumer can make her selection at a glance. In addition, the package should have genuine appetite appeal. It is recognized at once that there is no better way to accomplish this than by the use of a good picture. However, the picture must not confuse the consumer as to the identity of the contents or its form.

The package should state clearly the size of the fish, whether whole or in pieces, and how many are in the package. "The package should, in brief, be so descriptive in word and illustration that it provides the prospective customer with the precise information she needs in order to select what she wants and to use it intelligently."

 ABSTRACTER: Roy C. Stevens

2.19 USE OF CHILLED SEA WATER AND DILUTE BRINES IN PLACE OF ICE FOR HOLDING SHRIMP ABOARD A FISHING VESSEL

Roach, S. W. and Harrison, J. S. M. (Pacific Fisheries Experimental Station, Vancouver, B. C.) Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 98, 23-24 (April, 1954)

This article describes chilled sea water holding equipment installed aboard the vessel Investigator No. 1, and presents the results of experiments with shrimp held in chilled sea water.

The sea water holding tank installed in the hold of the Investigator No. 1 is a 42 x 42 x 42-inch outside diameter, cubical tank made from 11-gauge steel plate and coated with a non-contaminating anti-corrosive paint. This tank is covered with one inch of cork insulation. The cooling coil used for chilling the sea water is a single circuit of 50 feet of 5/8-inch copper tubing externally nickel plated to resist corrosion in sea water. This coil was designed to accumulate ice on its external surface as hold-over refrigeration sufficient to offset overnight heat leakage. Refrigeration for cooling is provided by a 32-volt, direct-current, 1/3-horsepower, motor-driven, Freon-12, air-cooled condensing unit. A 32-volt, direct-current, 1/55-horsepower, motor-driven, 8-gallon-per-minute centrifugal pump is used to circulate the sea water in the holding tank.

The first experimental lot transported in chilled sea water consisted of 100 pounds of raw whole shrimp caught on November 14, 1953 in Stuart Channel and held for 8 days at 30° ± 1°F. before being unloaded at Vancouver, B. C. These shrimp were graded as acceptable upon arrival. A portion of this first lot frozen (heads off and uncooked) in water was judged acceptable after 7 days in frozen storage.

(over)

 ABSTRACTER: Martin Heerdt

3.238 NEW GLAZE METHOD CUTS SHRIMP PACKING COSTS

Anonymous
Quick Frozen Foods 16, No. 9, 106 (April, 1954)

A San Francisco company has developed a new glazing technique that is said to cut the costs of handling and shipping frozen shrimp. After a quick deep pre-freezing, the shrimp are packed in the carton over a bottom layer of slush ice, with a second layer of slush on top.

Since the shrimp are already frozen, the slush ice freezes on contact and does not settle enough to expose the top surface. In this way the shrimp are completely surrounded, although the amount of ice weight is substantially reduced.

The company found that, although the usual practice of pan glazing provides a high degree of protection, the cost to the packer is too great. First it is necessary to freeze each batch in a pan and then to refreeze in the carton. The main cost to the packer, however, is the 25 to 30 percent excess ice shipped with the product.

The new technique is said to provide a protection equal to pan glazing, yet the refreezing operation and double handling of cartons are eliminated.

 ABSTRACTER: Roy C. Stevens

MOISTURE LOSS IN FROZEN SHRIMP

HOLDING SHRIMP IN CHILLED SEA WATER

FROZEN PACKAGE DESIGN

NEW SHRIMP GLAZING METHOD

2.19 (Cross Reference: 1.85)

The second experimental lot transported in chilled sea water consisted of 600 pounds of raw whole shrimp caught on January 21, 1954 near Cape Lazo, placed in sea water at 41° F., cooled down to 30 ± 1° F., and held for 4 days at that temperature before being unloaded at Vancouver. Samples of this second lot were cooked and picked under commercial conditions. The cooked shrimp were of good quality but difficult to peel.

Commercially caught shrimp less than 24 hours old were held in various 30° F. salt (sodium chloride) brines somewhat stronger than sea water in an attempt to overcome peeling difficulties. Preliminary findings showed that shrimp that had been held in chilled brines containing up to 6 percent salt gave a cooked product that could be more easily peeled. These shrimp also were more firm and of better quality than raw shrimp held in chilled sea water at 30° F. for the same length of time.

3.238 (Cross Reference: 1.85)

3.238 (Cross Reference: 1.85)

Weight losses of 5-lb. packages of glazed and unglazed raw shrimp, packed in waxed cartons, with and without overwraps of cellophane or paper waxed with a resin-fortified wax blend, were determined at intervals during 12 months' storage at 0 deg. F.

Results indicated that unglazed shrimp, packaged in cartons with an overwrap, showed negligible weight loss and were in excellent condition. Using blindfold taste tests, a special panel was unable to distinguish between glazed and unglazed shrimp packaged in overwrapped cartons. It was concluded that the glazing operation is not necessary if the carton has a satisfactory overwrap.

Elimination of the ice glaze reduced the defrosting time of a 5-lb. block of frozen shrimp approximately 36 to 55% (under cold running water) and reduced the weight of a corrugated fibreboard box, containing ten 5-lb. shrimp packages approximately 21%.

The glazed shrimp packaged in cartons without an overwrap showed high weight loss, evaporation of the ice glaze, bad desiccation of the surface shrimp and slight increase in toughness. These deleterious effects were somewhat reduced through the use of a more protective high-gloss waxed carton, but the resulting protection was less than that provided by a carton-overwrap combination for unglazed shrimp.

8.51 OCCURRENCE AND DISTRIBUTION OF SARCOSINE IN THE ROCK LOBSTER

Novellie, L. and Schwartz, H. M.
Nature 173, No. 4401, 450 (March 6, 1954)

The unidentified amino-acid found by us in the rock lobster (Jasus lalandii) has been shown to be sarcosine. We are indebted to Mr. R. G. Westall for suggesting that our unknown might be sarcosine and for sending us an authentic sample for comparison.

We had previously considered this possibility, but had rejected it because the R_F values of the unidentified amino-acid in phenol and butanol-acetic acid were appreciably different from the values reported for sarcosine in the literature and because it did not give the colour test with p-nitrobenzoyl-chloride described for sarcosine by Plattner and Nager. However, the test also gave negative results with sarcosine in our hands, and a direct comparison of the R_F values of the unknown and sarcosine in different solvents showed them to be identical, as may be seen from the following figures:

Solvent	Unknown	R_F Sarcosine	
		Found	Literature
Phenol - water (70:30)	0.88	0.88	0.80 (ref. 2) 0.78 (ref. 3)
Butanol - acetic acid - water (40:10:23)	0.19	0.19	0.24 (ref. 3)
Lutidine - water (3:1)	0.21	0.21	-----

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8.7 SOUTH AFRICAN FISH MEAL

Anonymous
Food Manufacture 29, No. 4, 167 (April, 1954)

The fish meal produced in South Africa, while acceptable to American and other overseas buyers, has not met all of the standards of the South African or American Governments.

According to the reports of the Fishing Industry Research Institute for the 1950-51 season, the protein content of the meals ranged between 53 and 71 percent and averaged 64.6 percent. The moisture content of these meals ranged between 1.9 and 16.1 percent and averaged 7.6 percent. The fat content of the meals ranged between 3.8 and 14.5 percent and averaged 9.7 percent. The average oil content of the meals, although below the officially determined maximum, was nearly twice the amount considered desirable in the U.S.A.

Fish meal quality can be improved by the retention of stickwater solubles or by the reintroduction of the stickwater or stickwater solubles into the presscake or the meal. Improving the quality of the meals in this manner is being done in Norway to withstand competition from synthetic feeds.

In the Union of South Africa, fish oil is sold on the basis of its iodine value, the standard being 180. In overseas markets, however, free fatty acids, moisture, and impurities are also considered. Twenty-two samples of crude fish oil (from the 1950-51 season), produced and analyzed in the Union of South Africa, showed iodine values of between 160 and 207, averaging 185. The free fatty acid content of these oils ranged between 0.75 and 3.6 percent and averaged 1.3 percent. The moisture content ranged between 0.1 and 0.9 percent and averaged 0.2 percent. Insoluble impurities usually were less than 0.01 percent and never exceeded 0.05 percent. The 1950-51 South African pilchard oils had iodine values averaging about 10 percent higher than the previous season.

 ABSTRACTER: Martin Heerdt

8.53 STUDIES ON MACKEREL FAT VARIATIONS: CORRELATION OF PLANKTON FAT WITH FAT OF FISH

Venkataraman, R. and Chari, S. T. (Fisheries Technological Station, Kozhikode)
Proceedings of the Indian Academy of Sciences XXXVII, No. 6, Sec. B, 224-227 (1953)

The authors determined the fat content of surface plankton, whole mackerel (Rastrelliger kanagurta) and mackerel flesh in an effort to correlate the fat content of the plankton with the fat content of the mackerel.

Plankton was obtained in a bolting silk net in hauls made off the coast. Each plankton haul was filtered and the filtrate was dried at 60°C. The fine powdery filtrate was collected, weighed into a thimble, and extracted with ethyl ether in a soxhlet extraction apparatus. Fat in the whole mackerel and in the mackerel flesh was determined by the method described in the previous paper of Venkataraman and Chari (1951).

Table 1 (omitted) and figure 1 (this card, over) show the average plankton fat content (moisture-free basis) and the average whole mackerel and mackerel flesh fat content (wet or fresh basis). According to the authors, these data show a definite relationship between the fat content of the whole mackerel and the mackerel flesh. They also confirm their previous conclusions regarding a major peak in fat content of mackerel during October-November and a minor peak during March-April.

Plankton fat was observed to fluctuate considerably with major peaks occurring during February, 1950 and May, 1951 and minor peaks during November-December, 1950 and March, 1951. The intense feeding of the mackerel during October-November and again during March-April may account for their high fat content during these periods. At these two intervals of the year the plankton are

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 ABSTRACTER: Martin Heerdt

7.0 COMPOSITION OF CERTAIN SPECIES OF FRESH-WATER FISH. I. INTRODUCTION: THE DETERMINATION OF THE VARIATION OF COMPOSITION OF FISH

Stansby, M. E. (Fishery Technological Laboratory, Seattle)
Food Research 19, No. 2, 231-234 (March/April, 1954)

The chemical composition of fish varies tremendously from one individual fish to another of the same species. Because of this variation, data on average composition has little meaning; of more importance is the establishment of the range of composition.

Because this variation in composition was not fully realized, much of the data in the literature is not representative of composition of fish in general, but merely shows the analysis of a single lot of fish. Data on the chemical composition of fresh-water fish is especially meager.

A project is being initiated to determine proximate composition of fresh-water fish. Methods of sampling and chemical methods of analysis to be employed (mostly those of the A.O.A.C.) are described.

 ABSTRACTER: M. E. Stansby

8.53 (Cross Reference: 1.1)

fat enough to contribute considerably to the fattiness of the mackerel. The peaks in plankton fat, however, do not coincide with the peaks of fat in the mackerel flesh and the whole fish. This may be due to the feeding activity or planktonic selectivity of the mackerel.

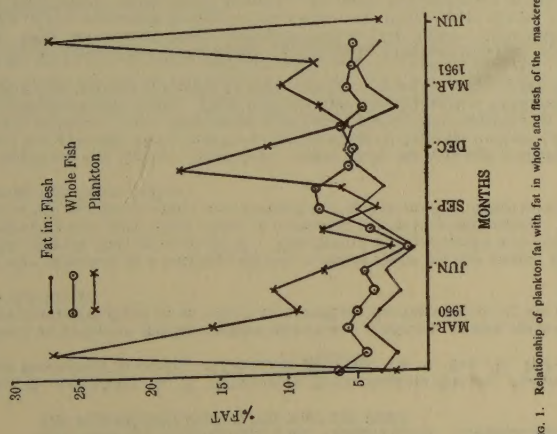

FIG. 1. Relationship of plankton fat with fat in whole, and flesh of the mackerels.

8.51

The difference between our R_F values and those of other workers may be due to the fact that our chromatograms were of necessity run at 30°.

Final proof of the identity of the unknown was obtained by isolating sarcosine from rock lobster hepatopancreas extract by fractionation on a sulphonated polystyrene resin (nominal divinyl benzene content 4 1/2 percent). The fraction containing sarcosine plus aspartic and glutamic acids, asparagine, proline, serine and threonine was chromatographed on a cellulose column using phenol-water (70:30) as solvent, and a fraction was obtained which contained only sarcosine and proline. This was crystallized from methanol-acetone to give chromatographically pure sarcosine, melting point 210.5-211.5° (decomp.), undepressed on admixture with the authentic sample. An examination of the infra-red spectra confirmed the identity of the two samples.

Appreciable amounts of sarcosine have been found in trichloracetic acid extracts of the hepatopancreas and blood of the rock lobster; but only traces were found in the muscle extracts. Hydrolysates of the hepatopancreas, blood and muscle proteins did not contain detectable amounts of sarcosine. The distribution of other amino-acids in the muscle and hepatopancreas extracts will be reported elsewhere.

We are aware of only two previous reports of the occurrence of sarcosine in the animal kingdom. It was isolated from the starfish Astropecten by Kossel and Edlbacher in 1915, and it has recently been found in elasmobranch fishes by Shewan. We have also found it in the freshwater crab Potamon (Potamonantes) perlatus/sydneyi, and we plan to look for it in other invertebrates.

7.0 (Cross References: 1.0118, 8.50)

8.7 (Cross References: 6.130, 1.016)

1.87 AUSTRALIAN TAIL EXPORTS TO U. S. NEAR FOUR MILLION POUNDS

Anonymous
Quick Frozen Foods 16, No. 9, 93-94 (April, 1954)

In a period of seven years, Australian exports of frozen rock lobster tails to the United States have grown to almost four million pounds. Exports of crayfish (rock lobster) earned $3.2 millions for Australia in 1952-53. This compares with $2.6 millions in 1951-52 -- an increase of 23 percent and more than triple the $1 million in 1948-49.

Of the total four-million-pound pack of frozen tails exported by Australia in 1952-53, 97 percent was taken by the United States.

Australian rock lobsters are caught by fishermen who operate either independently or as members of a cooperative. In only a few cases do the processors have interests in vessels.

The rock lobsters are caught in large "pots" or traps made of cane, wire, or wood. Each trap is capable of holding upwards of 40 fish. After they are removed from the traps the lobsters are kept alive until they are processed. Processing consists of drowning the rock lobsters in fresh water, removing the heads and ventral tubes, and washing the tails in a solution to remove bacteria. The tails are then wrapped in cellophane, cased in wooden boxes, usually twenty-five pounds to the case, and placed into the freezers.

Stringent regulations have been set up for the rock lobster tail industry by the Australian government. Inspection is rigid, and as a result the Australian pack has gained an excellent reputation in the American market.

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1.85 HANDLING SHRIMP ABOARD VESSELS AND AT THE DOCK

Pinson, Pedro L.
Southern Fisherman Yearbook, 54-57 (March 31, 1954)

The author describes methods used on shrimp trawling vessels fishing for his company in Mazatlan, Mexico. These vessels, averaging between 55 and 65 feet in length, operate on shrimp grounds that are located at distances varying between 50 and 600 miles from the home port. The average fishing trip is from 10 to 12 days.

Mazatlan vessels are thoroughly disinfected before the start of each season. Only purified ice made with filtered and chlorinated water is used on this company's boats. The author feels that the occurrence of "black spot" has been reduced by this means.

An average crew of eight men is maintained on these vessels, since the heads of the shrimp are removed on board. The handling steps are as follows:

To prevent damage to the shrimp, the bag is emptied from a height of no more than two feet above the deck. Because of the high temperatures prevailing in this area, the metal decks are covered either with lumber or cement. Once the bag has been unloaded, its contents are washed with salt water by means of pressure hoses. The shrimp are then separated from the scrap fish and debris and are washed again. The beheading process begins immediately and the beheaded shrimp are placed in 100-pound wooden boxes and mixed with a small amount of crushed ice. When the boxes are filled, the beheaded shrimp are dumped into straw baskets where they are washed again with a pressure hose.

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2.08 FRESH STOCKFISH: ICING

Williams, D. T and Willmer, J. S.
Fishing Industry Research Institute (South Africa)
Sixth Annual Report of the Director, 8-9 (March 31, 1953)

Delay in Icing

It was noted in the previous Annual Report that a delay of 3 hours before icing was sufficient to cause a noticeable effect on the keeping quality of stockfish.

On a commercial trawling voyage during which a time study was made of 22 hauls, ranging from 400 to 8,200 lbs. of fish, the following observations were made.

The time required for hauling up the net varied from about 20 minutes to about 45 minutes.

Average time spent by fish on deck (measured from time of releasing cod end until half the fish is stowed)	57 mins.
Maximum time on deck, (all hauls), i.e., time till last fish is stowed (This time was taken for a catch of 6,200 lbs. of fish).	165 mins.
Maximum time on deck (excluding last haul each day) (Only half the number of workers was used for the last haul each day).	98 mins.
Minimum time on deck (3,200 lbs. catch), i.e., time till first basket is stowed	less than 22 mins.

It was observed that, while the unavoidable delay in icing increased with increasing weight of catch, the rate of cleaning of fish also increased, in linear relation to the total weight cleaned. For

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1.85 FROZEN SHRIMP -- NOW 57% OF CATCH AND NO END OF GROWTH IN SIGHT

Anonymous
Quick Frozen Foods 16, No. 9, 89-90, 154 (April, 1954)

In eight years the frozen markets' share of the annual United States shrimp catch has grown from 10 percent to 57 percent. Despite this increased production the demand has kept pace.

A comparatively new industry, the shrimp industry did not get its start until after the close of World War II. With the discovery of the huge shrimp beds off the coast of southern Mexico in 1949 the industry experienced a tremendous boom. By 1953 the total U. S. shrimp production reached 206 million pounds. The value of the frozen pack alone amounted to about $50 million at the processors' level.

The shrimp industry in the U. S. is now freezing about 70 million pounds heads-off annually. This accounts for about 118 million pounds of whole shrimp since heads make up 40 percent of the weight of the shrimp. Of the remaining 88 million pounds of heads-on shrimp in other-than-frozen state, about 30 million pounds go to market canned and 7 1/2 million pounds go to the Louisiana drying sheds. This leaves about 50 1/2 million pounds for the fresh market.

Most of the production now going to canners and to the drying sheds is of shrimp too small to process for freezing. Of the shrimp now marketed fresh, it is expected that 75 to 80 percent will eventually be absorbed by the frozen industry.

In the order of their frozen shrimp production, the shrimp freezing states are: Texas, Louisiana, Florida, Mississippi, Georgia, South Carolina, Alabama, and North Carolina.

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AUSTRALIAN ROCK LOBSTERS

ICING OF FISH

HANDLING SHRIMP ABOARD VESSELS

FROZEN SHRIMP INDUSTRY

2.08 (Cross Reference: 2.19)

instance, when the number of baskets (100 lbs. each) to be cleaned rose from 8 to 51, the number of fish cleaned per minute increased from 14 to 31. The time for cleaning varied between 3.7 and 0.9 times (averaging 1.8 times) the time required for stowing.

There was no relationship between the ratio of cleaning to stowing time and the time required for cleaning.

Rate of Cooling in Ice

A series of experiments in which stockfish, surrounded by crushed ice, were covered by layers of either 1" or 5" of ice, revealed that at an ambient temperature of 75° F., the former fish took approximately 65 minutes to cool from 60° F. - 35° F., whereas the latter took approximately 83 minutes to cool through the same temperature range. All values given are the average of several experiments.

At an ambient temperature of 40° F. - 45° F. a similar effect was observed, though cooling of the fish is slower. For 1" of ice the cooling time (60° F. - 35° F.) was 100 minutes, whilst for 5" of ice the cooling time was 130 minutes. Thus the cooling under 1" of ice again took approximately 80% of the time taken under 5" of ice.

These results confirm those of this Institute reported in the Fourth F.I.R.I. Annual Report, namely, that cooling in ice is considerably faster at room temperature than at relatively low ambient temperatures.

1.85 (Cross Reference: 3.230)

Although some shrimp come from the Atlantic, the greatest source of production by far is the Gulf of Mexico. For the past five years, the waters off southern Mexico, and particularly north of the Yucatan Peninsula, have been the outstanding sources of shrimp production, with trawlers from most Gulf ports participating. About one third of Mexico's 50 million pound annual production comes from this same Yucatan area.

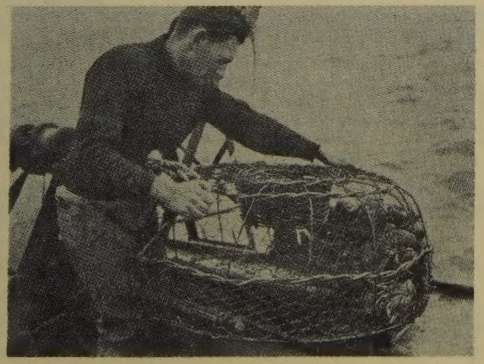
The growth of the frozen shrimp industry was held back, until recently, by a lack of freezing facilities. This situation is quickly being corrected by the addition of new freezers each year. About 25 custom-freezing plants operating in the Gulf area serve the shrimp industry exclusively. Other freezers handle some shrimp. In addition, shrimp processors and packers operate about 50 private freezing plants, set up mainly for freezing their own production.

The increased use of freezer-boats is also relieving the strain on land-based freezers. Some ten trawlers are presently equipped to do all processing and freezing aboard. These vessels may remain at sea for as long as two months, and when they land, their production is processed, packed, frozen and ready for market.

Of the some 6,000 U. S. vessels engaged in shrimp fishing, between 2,500 and 3,000 are large enough to make long trips to the Gulf of Mexico or to the Atlantic. The trend has been to larger and larger vessels until today the average shrimp trawler is around 70 feet long and has fuel, ice and water capacity to remain out of port as long as necessary to catch a cargo of shrimp.

The modern shrimp trawler carrying its own freezing plant costs around $100,000 today. Without freezing equipment, larger trawlers cost from $30,000 to $75,000, depending on type of construction, insulation, power and equipment. The small bay and bayou trawlers range in size from 20 to 45 feet and range in value from a few hundred dollars to as much as $15,000.

1.87 (Cross Reference: 1.017)



Rock lobsters are caught in large pots or traps which hold 40 or more fish.

1.85 (Cross Reference: 2.19)

The washed shrimp are placed back into the wooden boxes and lowered into the hold. When at least one-half ton has collected, the shrimp are placed in the bunkers with alternate layers of ice. The bottom layer of ice is never less than 6 inches if the hold is well insulated. On boats with deficient insulation, the bottom layer should be considerably higher.

From time to time, especially during the last part of the trip the first loaded bunkers are turned out and reiced. Perforated shovels are used for this purpose. When the boat has docked, the shrimp are placed in straw baskets, and, once outside the hold, loaded into wooden boxes and trucked out to the freezing plants. In all these movements the shrimp remain mixed with the ice of the bunkers. The wooden boxes are steam-washed after use.

8.59 TAURINE IN FRESH AND ICED SKELETAL MUSCLE OF CODLING (GADUS CALLARIAS)

Jones, N. R. (Torry Research Station, Aberdeen, Scotland)
Biochemical Journal 56, No. 3, xxii (March, 1954)

Ethanol (75% v/v) extracts of codling muscle have been chloroform-separated (Awapara, 1948) and subjected to two-dimensional chromatography in phenol-ammonia and collidine-lutidine (Dent, 1948). Chromatograms showed a large ninhydrin-reducing spot, R_F values: phenol, 0.41; collidine, 0.40. This was not attributable to any basic extractive found in codling or the related gadoid haddock (Gadus aeglefinus) by separation on sulphonated polystyrene (SPX) columns (Shewan, 1953; Shewan, Fletcher, Partridge & Brimley, 1952).

Pretreatment of chromatograms with $CuCo_3$. -$Cu(OH)_2$ (Crumpler & Dent, 1949) did not affect the running of the spot, and its detection in effluents from SPX columns indicated an acidic nature. R_F values in different solvents, final isolation from effluents by the method of Campbell & Work (1952), and also direct separation on Dowex 2 columns identified the substance as taurine. Estimated by a spot-elution method (Thompson, 1951) at 400-450 mg./100 g. muscle, taurine is quantitatively among the more important of the nitrogenous extractives. It has been reported in the liver and bile of other fish species (Ackerman & Mohr, 1937; Sihn and his collaborators: Asikari, Kim & Sihn, 1938; Sihn & Maeda, 1938; Sihn & Kim, 1938; Minato & Nisaburo, 1949) in herring (Clupea harengus) extractives (Morner, 1937), and in dried Japanese cod (Gadus Brandtii) by Yoshimura & Kanai (1913).

Gutted codling, iced to simulate practical fish-trade conditions, became rapidly depleted of taurine. Some 40 mg./100 g. only remained after 21 days, the greatest rate of loss being over the first 4 days. Non-protein N fell from 380 to 260 mg./100 g. over 21 days.

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6.3 PRELIMINARY EXPERIMENTS IN THE USE OF CHLORELLA AS HUMAN FOOD

Morimura, Yuji and Tamiya, Nobuko (Tokugawa Institute for Biological Research, Tokyo, Japan)
Food Technology 8, No. 4, 179-182 (April, 1954)

Dried and powdered cells of Chlorella ellipsoidea were used in most of the experiments. This powder is dark green and somewhat hygroscopic. In appearance it is similar to powdered green tea. In taste it is similar to powdered green tea and powdered dry "aonori", a seaweed (Enteromorpha compressa) commonly used as seasoning in Japanese cookery.

Chlorella powder was added to various common foods to check for strange or disagreeable taste sensations. Tasting was done by several adults, both American and Japanese.

(a) Powdered green tea ("hiki-cha") served as a suspension of tea powder in hot water. Chlorella powder could be mixed with powdered green tea in quantities of up to 20 percent by weight without causing a significant change in the taste of the tea suspension in hot water.

(b) Soup western style. One or two teaspoons of chlorella powder could be added to bean, mushroom, or beef soup, or to consomme with excellent results.

(c) Soup Japanese style. One to two teaspoons of chlorella powder was added with pleasing results to one cup of a soup prepared from boiled bonito.

(d) Noodles western style. Tasty green noodles were prepared by kneading 9.4 g. of chlorella powder with 142 g. of flour, 3.3 g. of salt, and 60 ml. of water.

(over)

 ABSTRACTER: Martin Heerdt

6.133 RAPID LIQUID-LIQUID EXTRACTION WITH CENTRIFUGAL UNIT

Anonymous
Chemical Processing 17, No. 5, 138-139 (May, 1953)

A liquid-liquid countercurrent centrifugal extractor for use with systems of two immiscible liquids has recently appeared on the processing-equipment market. This extractor, which is powered by a 1 1/2-h.p. electric motor, has an 80-g.p.h. capacity that makes it suitable for small-scale production. Because of its almost instantaneous extraction feature, samples as small as one gallon may be processed.

The bowl, which operates at atmospheric pressure, reaches operating speed in only a few seconds. Extraction takes place almost instantaneously. The location of the interface between liquids is maintained mechanically and can be varied. The extractor can be taken apart, cleaned or modified, and reassembled in less than 5 minutes. Mixing and separating assemblies of from 1 to 5 stages can be placed in the tubular bowl. Mixing blades are mounted on a stationary shaft, whereas special baffles incorporated in the mixing zones and liquid-accelerating vanes in the separating zones rotate with the bowl. The heavy liquid is fed through a shaft into the bottom mixing section, whereas the light liquid is fed into the top section (see cross sectional view, this card, over).

The light liquid, upon entering the mixing zones through baffles, between states, mixes with the heavy liquid. The mixture then flows both ways through other baffles between stages and is separated by high centrifugal force in zones located above and below the mixing zones. The light liquid leaves at the bottom of the bowl over a ring dam and flows out of the extractor by gravity through a collector at the bottom of the frame. The heavy liquid flows over a ring dam at the top of the bowl and out through a top collector.

(over)

 ABSTRACTER: Martin Heerdt

6.3 SEAWEED PROCESSING IN IRELAND

Anonymous
Food Manufacture 29, No. 4, 166 (April, 1954)

A new seaweed manufacturing company in western Ireland has begun to extract alginates to make seaweed meal for cattle food and to grind and pack carrageen. The raw weed is harvested each year during the month of June by boats that scythe the weed from rocks with sharp, broad-bladed knives. Each boat harvests a daily total of about 3 tons of weed.

Carrageen moss is the most commonly known of the seaweeds harvested. Groups of Irish families who work together (10 to 12 families in a group) to harvest the carrageen beds in their village earn up to £ 700 in a season. A new machine for cleaning and grading carrageen moss at the rate of 2 1/2 pounds per minute has recently been built by the Institute of Industrial Research and Standards at Glasnevin, Dublin. This machine is still in the experimental stage.

During the recent world war the carrageen moss production potential of Ireland was found to be about 600 to 700 tons a year. Since 1950, however, only about 250 tons of carrageen moss have been harvested annually. A very selective market for the moss is available in the U.S.A. By using new mechanical methods for cleaning and grading the moss it should be possible to meet the quality standards imposed upon the industry by the United States importers.

During the autumn season of the year the Atlantic tides tear large quantities of Laminaria, another type of seaweed, from its moorings among the deep water rocks and deposit it in quantity above high-water mark on shore. This weed has 12-foot-long rubbery stems as thick as a man's arm. These stems are collected and spread upon the loose stone walls along shore to dry in the wind.

(over)

 ABSTRACTER: Martin Heerdt

TAURINE IN COD MUSCLE

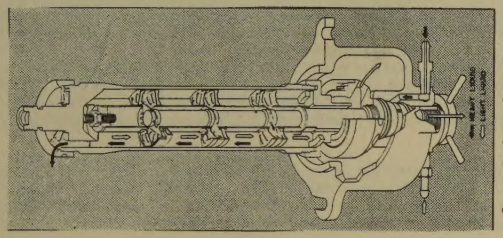
CENTRIFUGAL LIQUID-LIQUID EXTRACTION

USE OF CHLORELLA IN HUMAN FOODS

SEAWEED PROCESSING IN IRELAND

6.133 (Cross Reference: 6.231)

The rotational speed of the extractor can be varied from 15,800 r.p.m. (6000 g.) to 23,650 r.p.m. (14,000 g.). In many liquid-liquid systems where optimum flow exists, 100 percent extraction efficiency can be obtained. The liquid-liquid interface is automatically established by preset ring dams and is not affected by the volumetric flow ratio between the two liquids. Liquid flow is the only factor that needs to be monitored. All other factors are automatically set by the manner in which the bowl was assembled before the start of the run.



Cross-sectional view of unit, showing flow of heavy and light liquids

6.3

When dry, the weed is purchased by a factory buyer for about $5.00 per ton. Ireland has only begun to exploit the industrial possibilities of Laminaria, which, when kiln dried and pulverized, provides a source of alginates.

Another western Ireland company also makes and sells alginates for export. When the quantity of Laminaria processed in 1953 was less than normal, this company maintained full and continuous employment by operating its plant for a part of the year on Ascophyllum, another type of seaweed. A total of £ 10,000 worth of Laminaria and Ascophyllum seaweed was purchased by this company in 1953.

8.59

Incubation of muscle minces and aerated mixed muscle and skin homogenates at 0° led to little change in taurine content over 6 days, although a heavy, typical marine spoilage microflora became established. It appears that the initial rapid drop in taurine in iced muscle probably derives from leaching by ice water.

6.3

(e) Noodles Japanese style. Chlorella powder used in place of 2 to 5 percent of the buckwheat and wheat flour produced a green noodle almost identical with "cha-soba", a buckwheat noodle, which contains powdered green tea.

(f) Bread and rolls. Green colored French bread having an agreeable taste was made by adding 56 g. of chlorella powder to 852 g. of white flour, 14 g. of sugar, 27 g. of salt and 5 g. of dry yeast.

(g) Cookies. Different kinds of cookies were prepared by mixing chlorella powder 4.7 g. with 226 g. of cake flour, 114 g. of sugar, 1/4 pound of butter, and 1 egg.

(h) Ice cream. Large amounts of chlorella powder could be added to ice cream. The characteristic algal taste accentuated the basic taste of the ice cream. The ingredients used in making the ice cream were 71 g. of chlorella powder, 1000 g. of evaporated milk, 473 ml. of fresh milk, 89 g. of flour, 227 g. of sugar, 2 eggs (98 g.) and 30 ml. of vanilla extract.

The use of chlorella in the various foods increased their protein, fat, and vitamin A and C content. The protein and fat content of the bread and noodles, for example, was increased 20 and 75 percent, respectively. An attempt to extract a "tofu" or soybean curd-like material from chlorella cells was unsuccessful, but chlorella powder was successfully hydrolyzed to yield a solution that may be used as a substitute for soy sauce.

3.230 HANDLING SHRIMP IN THE PACKING AND FREEZING PLANT

Strasburger, L. W.
Southern Fisherman Yearbook, 58-61 (March 31, 1954)

The steps in the packing and freezing of shrimp are outlined.

First of all, care must be taken in the unloading of the shrimp in order to prevent breakage and to keep separate any pockets of shrimp that appear decomposed. They are then delivered to the wash tanks.

The water in the wash tanks must be changed frequently to avoid bacterial build up. The shrimp are brailed from the tank or are carried out on a conveyor belt, which takes them to the graders.

Three types of decomposition are watched for by the graders: (1) the visual type of heated shrimp, generally distinguished by color changes; (2) blackening or melanosis, often called "ice burn"; and (3) "stinkers", or shrimp that show no outward sign of decomposition, but possess a foul and oftentimes putrid odor of decomposition.

The heading operation is performed manually. Grading for size, in this country, is generally accomplished by means of one of several makes of mechanical graders. After they are graded for size, the shrimp are hand packed into paper board cartons, weighed, and -- if in small containers -- overwrapped, then sent to the freezer. Put-in weights must be varied according to the species of shrimp being frozen. Moisture loss is greatest on pink shrimp, less on brown shrimp, and least on the white.

(over)

 ABSTRACTER: Roy C. Stevens

3.12 FRESH STOCKFISH: PRESERVATIVES

Rowan, A. N. and Willmer, J. S.
Fishing Industry Research Institute (South Africa), Sixth Annual Report of the Director, 9,(March 31, 1953)

Hydrochloric Acid

Fresh fish were dipped in solutions of hydrochloric acid in saturated brine for one minute and then stored in ice. The strengths of hydrochloric acid used were 0.6%, 1.2% and 1.8%. Undipped controls were stored with the dipped fish. The controls and the fish dipped in 0.6% HCl in brine were slightly sour after 10 days whereas those dipped in the higher concentrations of HCl were slightly sour after 12 days' storage, and those in the 1.8% HCl showed slight coagulation of protein on the exposed nape. The slight improvement in quality of the dipped fish was not thought to warrant further work in this direction.

Citric Acid

By dipping stockfish in a 1% solution of citric acid for 30 minutes it was found that experimental fish were just beginning to smell 'off' after 10 days, as compared with a definite sour odour after 7 days in the control fish. Cutlets of the dipped fish were boiled after 9 days -- there was no detectable acid flavour, and the appearance and texture of the fish were normal

Malonic Acid

A 30 minute dip in 0.2% malonic acid did not appear to preserve stockfish; neither did it prevent softening of the flesh.

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3.12 TOXICITY OF AMINES FOR BACTERIA

MacLeod, R. A. and Onofrey, Eva (Pacific Fisheries Experimental Station, Vancouver, B. C.)
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 98, 22-23 (April, 1954)

Triethanolamine, a water-soluble inorganic base, is toxic to bacteria on some mediums and non-toxic on others. The authors attempted to determine what factors affect the toxicity of triethanolamine.

High concentrations of potassium ion were found to overcome the toxic effect of triethanolamine. Since potassium is required by the test organism for growth, the authors at first reasoned that triethanolamine was interfering with the utilization of the nutritionally essential potassium ion. Further study, however, disproved this reasoning and revealed that sodium,ammonium, magnesium, and calcium ions also overcame the toxic effect of triethanolamine. In addition, the hydrogen ion concentration was found to affect the activity of triethanolamine in that levels that were toxic at pH 7 were non-toxic at pH 5. Triethylamine and tri-n-propylamine were affected by inorganic ions in the same way. Tri-n-butylamine, however, was not affected by high concentrations of inorganic ions.

According to the literature, trypaflavine, methylene blue and various antimalarials also can be affected by inorganic ions in the same way as the amines. Regardless of their difference in structure, all compounds affected by inorganic ions have one thing in common; they are amines. It appears, therefore, that the mechanism by which amines exert their toxic action is fundamentally the same. This toxic action is believed to result from a combination of the positive amine ion with a negative site on an enzyme or a negative site in or on the cell of a bacterium. Positively charged inorganic ions by combining with this negatively charged site in competition with the amines protect

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 ABSTRACTER: Martin Heerdt

5.41 THE VITAMINS: A REVIEW OF DEVELOPMENTS IN 1953

Robinson, F. A.
Food Manufacture 29, No. 4, 145-147, 156 (April, 1954)

The year 1953 did not bring further progress in the elucidation of the chemical constitution of vitamin B_{12}. Vitamin B_{12} is synthesized by Rhizobium meliloti and Bacillus megatherium as well as by various species of Streptomyces. The relationship between the various forms of vitamin B_{12}, however, has received further attention.

The presence of the many different forms of vitamin B_{12} and of other growth factors in liver extracts and fermentation products has made the estimation of vitamin B_{12} in these preparations a difficult matter. Vitamin B_{12f} isolated from rat faeces has been shown to be a cyanide complex, probably identical with pseudovitamin B_{12}, which contains adenine in place of the dimethylbenzimidazole portion of the vitamin B_{12} molecule. A similar substance is found in the faeces of the cow, sheep, pig, horse, chicken, guinea pig, and man. Pseudovitamin B_{12} appears to be absent from liver extracts and does not promote growth in rats or chicks; however, it does stimulate the growth of bacteria.

Vitamin B_{12} and similar substances can now be separated selectively from one another by ionophoresis and then identified by their effects on suitable microorganisms. The similarity of the so-called factor A to vitamin B_{12m}, and pseudovitamin B_{12} to vitamin B_{12f}, as well as the dissimilarity of pseudovitamin B_{12} and vitamin B_{12f} to B_{12}, factor B, and factor C were demonstrated in this manner. Wijmenga's factor WR was found to contain vitamin B_{12}, pseudovitamin B_{12}, vitamin B_{12f}, and factors B and C.

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 ABSTRACTER: Martin Heerdt

PROCESSING FROZEN SHRIMP

BACTERICIDAL AMINES

FRESH FISH PRESERVATIVES

FORMS OF VITAMIN B_{12}

3.12 (Cross Reference: 2.01)

the bacteria against the action of the amines. The difference in the degree of toxicity of the different amines is apparently due to variations in the size and shape of their molecules.

Low molecular weight aliphatic amines, because of their undesirable odor, cannot be considered as preservatives of fish. The high molecular weight, less volatile aliphatic amines, however, might be satisfactory. According to this study these amines are most effective when the total salt concentration at their site of action is low.

5.41

Microbiological assay with Lactobacillus leichmannii or a mutant of Escherichia coli is probably the most widely used method of estimating vitamin B_{12}. The growth factors referred to in the preceding paragraph complicate the interpretation of the results obtained by this method unless they are first removed. Hydroxo-cobalamin (vitamin B_{12b}) should either be converted to the cyano-form by treatment with cyanide (the two substances do not behave similarly) or destroyed with ascorbic acid. The existence of alkali-stable factors that interfere with the microbiological assay (Robinson et al) has been confirmed.

Solutions of vitamin B_{12} or purified liver extracts that are now used as standard treatment for pernicious anaemia are stable for long periods provided they are not exposed to air or light. The conversion of cyano- into hydroxo-cobalamin, which is said to result on exposure of vitamin B_{12} solutions to light, may be reversed on storage in the dark. About 1 μg. of vitamin B_{12} per day given intramuscularly at intervals of three or four weeks is estimated as the quantity needed by pernicious anaemia patients. Actually, some other substance or substances appeared to be necessary to maintain the health of these patients.

For the present, the way in which vitamin B_{12} acts in curing or preventing anaemia cannot be explained, but on the evidence it appears to be associated with the methylation processes of the body. Distribution of a binding factor for vitamin B in the various gastric and intestinal areas of the pyloric mucosa corresponds with the distribution of Castle's intrinsic factor. A concentrate similar to the intrinsic factor has been prepared from sow's whey; both substances bind not only vitamin B_{12}, but also the vitamin B_{12}-like compounds, factors A and B and pseudovitamin B_{12}. Vitamin B is believed to form a complex with the binding or instrinsic factor in which state the vitamin is protected from destruction by intestinal bacteria. In the bound state vitamin B_{12} is capable of being absorbed into the systemic circulation and utilized for reticulocyte formation. Pernicious anaemia is thereby avoided.

3.230 (Cross Reference: 1.85)

Freezing methods vary throughout the industry, but those most used are the contact plate method and the air blast system. Each package must reach a center temperature of 0° F. before it is removed for glazing and storage. The greater part of the shrimp produced in this country and on the Gulf Coast of Mexico, are frozen in 5-pound containers, which are not overwrapped. However, there is a definite trend towards overwrapping these cartons, since this procedure has been so successful with the consumer-size packages.

Three methods of glazing are described: The spray method involves running the opened cartons of shrimp under a spray of either tap water or chilled water and inverting the cartons to drain off the excess water. The cartons are then placed in master cartons. A second method of glazing is the complete immersion of the cartons of shrimp in a vat of cold water. Both of the above methods are criticized by the author in that they permit ice to form on the outside of the cartons and thus cause them to stick together in the master cartons. A third system involves the flooding of the 5-pound carton with ice water, a time allowance for a complete glaze to form around each individual shrimp, then subsequent drainage and packing into masters.

Dehydration during storage is most rapid in plants using air blast systems. Another important cause of dehydration is the differential in temperature between the refrigeration and the storage room. A differential of 7 to 8 degrees will keep dehydration to a minimum.

The article is concluded with a discussion of sanitation factors.

3.12

Ester of Monobromoacetic Acid (Sopura G2/60)

Fresh fish were dipped for one minute in a solution of an ester of monobromoacetic acid. The strength used was 100 p.p.m. as recommended by the suppliers. After dipping, the fish were stored in ice, and untreated fish were stored as controls. The treated fish were adjudged to be sour after 12 days compared with 10 days for controls; and this slight lengthening of storage life was not thought to warrant the use of this preservative.

3.5 STUDIES ON THE RED HALOPHILIC BACTERIA FROM SALTED FISH AND SALT

Venkataraman, R. and Sreenivasan, A. (Fisheries Technological Station, Kozhikode, India)
Proceedings of the Indian Academy of Sciences 39, No. 1, Sec. B, 17-23 (1954)

The authors isolated a number of red halophilic organisms from various salts and salted fish. The isolations were made by streaking or plating out the red halophiles on plates of the salt-milk agar medium of Lockhead as modified by Hess (1942). A modified Gibbon's starch medium was also used for isolations from salts. Pure discrete colonies were subcultured on salt-milk agar slants. Media for studying physiological and biochemical reactions were prepared according to Gibbons (1937) except that potato slants were soaked for 48 hours in saturated brine and then sterilized for 20 minutes at 15 pounds pressure. Salt-milk agar plates containing 0.2 percent B.D.H. soluble starch were used for identifying starch hydrolyzing properties. All cultures were incubated at 37° C. and 75 percent relative humidity at 28-33° C. and 75 percent relative humidity, and at 4° C. and 75 percent relative humidity. None of the cultures grew at 4° C.

Red halophiles were found in salts obtained from four different sources. Fish from the Rameswaram area that showed the presence of red halophiles were black pomfrets, white pomfrets, mullets, Leiognathus, Sillago, catfish, Polynemus, Therapon, Pristepoma, dorab, and Hemiramphus. Catfish, Polynemus, shark, and skate from Adirampatnam also showed the red discoloration. On the West Coast, salted mackerel from Malpe and salted sole, mackerel, silver bellies, and shark from Calicut market showed considerable red discoloration. Shark, skate, mackerel, caranx, ribbonfish, seer, silver bellies, jew fish, sole and oil sardines, washed, gutted, and salted in the author's laboratory also developed red discoloration within varying lengths of time.

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 ABSTRACTER: Martin Heerdt

6.4 ROAD TO HIGH PROFITS

Anonymous
Chemical Week 74, No. 18, 20-22 (May 1, 1954)

Profits of typical large meat packers at present come largely from their byproducts operations. For one large packer in 1951, meat and other food sales represented 87 percent of total dollar value but only 22 percent of profits, with byproducts accounting for 13 percent of sales and 78 percent of profits. These byproducts -- chemical products obtained from the waste from the packing plant -- carried a profit load all out of proportion to their volume of sales. Under today's conditions, the success of a large meat packing concern rests very largely with how efficiently and how extensively these chemical products are recovered from the packing plant waste. While byproducts production is not new (glue recovery dates from 1870), it is only within very recent years that anything like the full potentiality of byproducts recovery has been visualized.

This situation prevails despite the fact that the market for packing house fats and oils for use in soaps, once the principal outlet for packing house byproducts, has shrunk tremendously because of the new synthetic detergent development. Research by meat packing plants has developed such new outlets for their oils as fatty acids, fatty-acid derivatives and blended shortenings.

In the field of fatty-acid derivatives, one concern is now manufacturing more than 200 compounds, including amines, nitrites, amides, ketones, and quaternary ammonium salts. Sales of these types of compounds for this one concern in 1951 totaled more than $32,000,000.

 ABSTRACTER: M. E. Stansby

3.231 FISH FREEZING PLANT IN BERGEN, NORWAY

Lorentzen, Gustav (Institutt for Kjoleteknikk, Trondheim, Norway)
Refrigerating Engineering 62, No. 4, 41-43, 100, 102 (April, 1954)

Bergen, on the west coast of Norway, is the home of a new modern fish freezing and cold storage plant. This plant, which juts out into the heart of Bergen harbor, has a 1500-ton (per 24 hrs.) freezer capacity, 1200 feet of wharves for loading coastal and trans-oceanic vessels, and ramp facilities for rail and truck shipments. The 6-story portion of the building, which covers 25,000 sq. ft. of ground area, houses most of the low-temperature storage rooms. The remaining 2-story portion of the building, which covers 60,000 sq. ft. of ground area, houses the various processing departments, freezers, general storage rooms, engine room, and offices. Reinforced concrete construction with flat slab-type floors and curtain walls have been used throughout the plant. This plant is designed for palletized-load operation throughout.

A single large room on the ground floor has space for the various processing lines which are changed with the seasons. A brine freezing plant for boxed whole herrings is permanently installed in the east end of this ground floor room. Air blast freezing of a large variety of products is conducted on the second floor, which contains, in addition, a number of smaller processing rooms, dry storage rooms, mess rooms, and offices.

The freezer storage rooms are designed for a variety of temperatures ranging from -13° to -31°F. Some of these rooms can also be used at cooler temperatures for fruit, vegetables, eggs, or salted fish. All of these storage rooms make use of a modified jacket system around the outside of the room. With this system, heat leaking through the insulation is picked up by cold air circulating through the jacket area and removed before it can enter the storage rooms proper. Since no heat of evaporation can enter the rooms from the outside, drying of the goods in the storage rooms is minimized.

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 ABSTRACTER: Martin Heerdt

3.12 FRESH STOCKFISH: PRESERVATIVES

Wiedersheim, M.; Willmer, J. S.; and Williams, D. T.
Fishing Industry Research Institute (South Africa), Sixth Annual Report of the Director, 9 (March 31, 1953)

Detergent "Z"

A preliminary test with detergent "Z" (a mixture of alkyl-dimethyl-benzyl-ammonium chlorides), used either in ice or as a dip, showed no effect on the storage life at a concentration of 100 p.p.m. and only little effect at 1,000 p.p.m., e.g., an increase of only one or two days over the seven day period of the controls. Moreover, the present day price of this detergent is too high for consideration in practice.

Sodium Propionate

Based upon evidence presented by Hill (J. Biol. Chem. 199, 329 (1952)) that sodium propionate inhibits the growth of Streptococcus faecalis, possibly by combining with coenzyme A and thus interfering with oxidative decarboxylation of pyruvate, an investigation into the preservation qualities of this reagent was made.

Using an ice containing 0.1% sodium propionate it was found that the keeping time of stockfish was extended to 13 days, the control fish in the experiments being 'off' by the tenth day. At the fifteenth day when the experimental fish were discarded, although they were badly 'off' no bacterial slime could be observed on the surface of the fish.

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HALOPHILIC BACTERIA IN SALT FISH

NORWEGIAN FREEZING PLANT

MEAT PACKING PLANT BYPRODUCTS

FRESH FISH PRESERVATIVES

3.231

A vapor barrier consisting of 5/32 in. of hot-mopped asphalt has been used to seal all insulation on the warm side of the room. Two layers of expanded cork board, having a total thickness of 9 1/2 in., have been used as insulation against heat leakage through all outer walls.

Block ice tanks and handling equipment placed on top of the building make possible the delivery of crushed ice by gravity to boats, trucks, and railway cars.

Four freon-12 centrifugal condensing units supply the major part of the refrigeration required. These are four-stage machines all of which are similar and are driven through speed-increasing gears by 700-h.p., 3-phase, slip-ring motors. Because of the extensive freon pipe system that would be needed to serve the entire cold storage plant it was decided to use instead a low pressure indirect ammonia system. Ammonia from the various coolers is condensed in the freon evaporators at low temperature and re-circulated by means of centrifugal pumps.

All critical temperatures in freezers, storage rooms, and brine coolers can be read from the engine room where they are also automatically recorded. The cold rooms are fitted with magnetic and pilot-operated stop valves controlled either by a thermostat or manual switch in the engine room.

The heat exchangers are of the floor-mounted unit type with galvanized coils. This same type of unit is used to cool the jacket air which surrounds the freezer storage rooms. The ammonia supply for these heat exchangers is controlled by an ordinary float valve. A hot-water spray system for defrosting of the heat exchangers has been used to minimize time lost in defrosting.

The main activities of this new Bergen plant will be devoted to freezing local herring, tuna, whale meat, and other products. The plant will also act as a central cold storage warehouse for a number of other freezing plants located along the coast of Norway and for accumulating goods prior to shipment all over the world.

3.12

Sodium Nitrite

Approximately 2 1/2 tons of stockfish on board a trawler were stowed in ice containing 0.2% of sodium nitrite, simultaneously with a similar quantity of fish in untreated ice.

On landing, 2-3 days after catching, both groups were brined overnight, filleted, re-brined in 75% saturated brine containing 1% potassium nitrate on the weight of salt, for 1/2 hour to an hour, and smoked. Examination of the smoked fillets for nitrite showed little difference between the two groups, each containing about 50 p.p.m. of nitrite nitrogen.

It was observed, however, that while about 2.4% by weight of the untreated fish was rejected after brining as unsuitable for filleting, only 0.6% of the nitrite-treated fish was rejected.

Further tests are to be made in this direction.

3.5 (Cross Reference: 0.5)

A technical description is given of the following organisms as obtained in pure cultures: 3 strains of Sarcina sp. from salted catla (Mettur) and salted sole, 1 strain of Micrococcus sp. from sole salted in the laboratory, 1 strain of Micrococcus morrhuae Klebahn from Tuticorin salt, 1 strain of Micrococcus sp. from salted mackerel, 2 strains of Sarcina sp. from salted mackerel and sole, 1 strain of Sarcina littoralis (Lockhead, 1934) from common salt, and 1 strain of what appeared, except for gram reaction, to be Serratia species b (Gibbons, 1937) from Vedaranyam salt. Proteolytic tendencies were noticed in the rod and in four of the cocci.

Direct examination of material from the surface of red salted fish consistently showed gram positive sarcina, gram variable non-sporing rods, short and stout gram positive rods, and gram positive rods with terminal spaces or "racket forms."

The starch medium with salt, starch, beef infusion and tryptone was found to be much better than Lockhead's salt-milk agar, with growth becoming apparent in 48 hours in most cases. Chromogensis, however, was poorer.

Using fish salted in the authors' own laboratory, it was found that shark and skate became red in 19 to 30 days; mackerel in 30 days; caranx, ribbon fish, and seer in 45 days, silver bellies in 90 days, and oil sardines in 120 days. Salted fresh-water fish such as catlo, labeo, and catfish also were susceptible.

6.4 (Cross Reference: 6.0)

2.01 MICROBIOLOGICAL DETERIORATION OF FISH POST MORTEM, ITS DETECTION AND CONTROL

Tarr, H. L. A. (Pacific Fisheries Experimental Station, Vancouver, B. C.)
Bacteriological Reviews 18, No. 1, 1-15 (March, 1954)

This important article is abstracted in three parts, this first part covering that portion of the report dealing with general aspects of fish spoilage and its retardation by physical methods. The flesh of fish is sterile; fish slime and the digestive tracts of feeding fish contain variable kinds and amounts of bacteria. The bacteria that invade the flesh after capture of the fish generally resemble those of their marine environment. Achromobacter, Pseudomonas, Flavobacterium, and Micrococcus genera usually predominate, and Sarcina, Proteus, and Bacillus occur less frequently. Pigment-producing bacteria are occasionally present and may cause objectionable discoloration in refrigerated fish.

In early spoilage of fish (especially teleost fishes) micrococci and flavobacteria predominate. As spoilage advances these are overgrown by the Pseudomonas and Achromobacter species.

The growth of microorganisms in fish results in the decomposition of proteins, lipids, and carbohydrates. Very incomplete information is available as to the compounds formed; most such information has been obtained incidental to development of chemical tests for fish spoilage.

Bacterial action, not autolysis, is responsible for most of the breakdown of proteins and other tissue constituents during spoilage under normal conditions. In the early stages of decomposition, amino nitrogen decreases slowly and ammonia correspondingly increases; in later stages both increase.

Glycogen in fish muscle occurs in varying quantities (up to 0.85%) depending largely on the amount of struggling occurring during capture. Glycogenolysis occurs rapidly at 0° C. and reaches a peak with frozen fish at temperatures of -3° C. Lactic acid is produced both from glycogen and from other carbohydrates. Lactic acid is broken down by bacteria with the production of acetic acid and carbon dioxide.

(over)

 ABSTRACTER: M. E. Stansby

3.12 MICROBIOLOGICAL DETERIORATION OF FISH POST MORTEM, ITS DETECTION AND CONTROL

Tarr, H. L. A. (Pacific Fisheries Experimental Station, Vancouver, B. C.)
Bacteriological Reviews 18, No. 1, 1-15 (March, 1954)

This second abstract covers that portion of this article dealing with the effect of chemical agents on microorganisms causing fish spoilage. Action of salt in preserving fish is a combined effect of dehydration due to osmotic action, the toxic effect of chloride ions, the relative insolubility of oxygen in strong brines, and the depression of activity of proteolytic enzymes. The red discoloration often occurring on salted fish is due to development of salt-tolerant members of the Serratia and Sarcina genera. Such growth occurs only above 10° C. and is not greatly inhibited by ultraviolet light. These strains may grow even in media containing saturated (27%) sodium chloride. A brown discoloration (known as "dun") occurs sometimes and is caused by halophilic brown molds of the Sporendonema genus. Elimination of these difficulties is best attempted by sterilizing the premises with chlorine, formaldehyde, lye, or sulfurous acid. The final salted product can be treated with propionic acid such that 0.1 to 0.2% remains in the product. Another quite effective treatment involves use of a curing salt containing 3% sodium acid phosphate and 0.25% sodium benzoate.

Storage of iced or chilled fish in atmospheres containing about 50% carbon dioxide shows a marked retardation of bacterial spoilage. Concentrations of carbon dioxide of less than 40% have little or no effect. The storage of fish in a carbon dioxide atmosphere has an adverse effect on the appearance of the fish. Both ethylene oxide and propylene oxide markedly retard bacteriological spoilage of fish muscle, but both also accelerate oxidative rancidity and tend to denature muscle protein.

(over)

 ABSTRACTER: M. E. Stansby

2.19 FRESH STOCKFISH: TEMPERATURES IN TRAWLER FISH HOLDS

Williams, D. T.
Fishing Industry Research Institute (South Africa), Sixth Annual Report of the Director, 9 (March 31, 1953)

Measurements made by means of a ten-point thermocouple outfit with electronic galvanometer substitute on board a trawler equipped with an insulated fishroom, indicated that, while there was little appreciable difference in minimum temperature reached in different parts of the fish-room, there was an appreciable difference in the rate of cooling of fish between the area of the ponds near the hull, and that amidships.

Thus fish near the hull required an average of about 15 hours to drop to within 1° F. of the average minimum temperature of 33.8° F., while those amidships required an average of 3 hours.

This preliminary finding is to be followed up.

 Reprinted in whole

7.85 MICROBIOLOGICAL DETERIORATION OF FISH POST MORTEM, ITS DETECTION AND CONTROL

Tarr, H. L. A. (Pacific Fisheries Experimental Station, Vancouver, B. C.)
Bacteriological Reviews 18, No. 1, 1-15 (March, 1954)

This third abstract covers that final portion of this article dealing with tests for detecting bacterial spoilage of fish. A determination of the number of bacteria present is sometimes used as a measure of the degree of spoilage. Much disagreement as to the value of such a test exists. While a few writers believe that bacterial counts are completely valueless, this extreme view is not shared by the author of the present article who states "It is suggested that a given test will be reliable and give reproducible results only under certain defined conditions, and that any alteration of these conditions may render the results of such a test invalid. If this statement is accepted, it is obvious that most tests, when applied to similar material held under identical conditions, as in experimentally treated and untreated samples, will usually give satisfactory comparison of the relative rates of spoilage. On the other hand, attempts to compare, for example, organoleptic rates of spoilage of whole dressed fish with fillets cut from them by means of a single test, such as a bacterial count, will probably fail, for it is highly likely that the whole fish may have a very much lower count than the fillets at a stage when both are considered inedible."

Chemical tests for spoilage which have been proposed include tests for indole, volatile acids, hydrogen sulfide, and tyrosine. Tests for the volatile bases, ammonia, dimethylamine, and trimethylamine are discussed in greater detail. These tests, especially a test for trimethylamine, are of considerable value for use with certain Atlantic Coast species such as cod, but are of little or no value for many species of the North Pacific Ocean. This is ascribed as probably being due to the different pH values of the muscle of different species of fish. Dimethylamine has been found

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 ABSTRACTER: M. E. Stansby

SPOILAGE OF FISH

FISH HOLD TEMPERATURES

CHEMICAL PRESERVATION OF FISH

FISH FRESHNESS TESTS

7.85 (Cross Reference: 7.81)

to be of value in detecting changes occurring during the early stages of spoilage of a few species of fish. Tests for ammonia are generally considered to be of very limited value. A test based on determination of volatile reducing substances in Pacific Coast species of fish seems to give most reproducible results for the widest variety of species of any test so far proposed.

Tests based on determination of buffer capacity of fish flesh and of pH of fish fillets are generally considered to give unsatisfactory results.

A bibliography of 132 references is included at the end of this article.

2.01 (Cross References: 2.00, 2.02)

D-ribose occurs in fish muscle post-mortem; sometimes as much as 800 micrograms per gram being present.

From less than 1 to 20% or more of lipid occurs in fish flesh, the amount depending upon species, season, age, environment and degree of sexual maturity. Oxidation of the unsaturated fatty acids occurs more as a reaction catalyzed by haem compounds than as a result of bacterial action. In advanced bacterial spoilage extensive hydrolysis may occur as the result of the action of lipolytic enzymes.

Most bacteria associated with fish are faculative psychrophiles growing in the temperature range of -7.5° C. to 30° C. The temperature coefficient of growth for most spoilage organisms is considerably greater in the range -4 to +5° C. than at higher temperatures. Thus, in one experiment, spoilage was twice as rapid at +2.8° C. as at -0.3° C. Storage of fish at or just above their freezing point is thus an effective method of reducing spoilage.

The pH of living muscle is close to 7.0 and falls as lactic acid accumulates, usually to somewhere in the range pH 6.0 to 6.6. With some species an even lower pH is reached (e.g. with halibut pH 5.6 or lower). Upon passing off of rigor, as a result of accumulation of volatile bases, the pH generally rises somewhat. With such species as haddock and cod a pH value of 7.0 and even higher is reached at moderate stages of decomposition. With other species such as salmon, very little rise in pH takes place, and such a situation may have a retarding influence on spoilage. Artifical adjustment of pH to retard spoilage has been attempted but has not achieved success.

Freezing causes an intitial decrease in numbers of viable bacteria; freezing rate has little effect. During subsequent storage, bacteria are killed more rapidly at high than at low storage temperatures. Some bacteria species are more resistant to freezing and storage than others.

In dehydrated fish (including that dehydrated by action of salt) bacterial and mold action are greatly affected by the moisture content of the fish. In one experiment bacterial growth occurred only when the moisture content exceeded 19 to 19.7%. Visible mold action occurred only above 16.8% moisture. Increase in volatile base content of such fish occurred at moisture levels insufficient to permit action of microorganisms.

Ultraviolet light has a slight but definite effect on reducing bacterial contamination. Ionizing radiations, because of their much greater penetrating powers, are much more effective.

3.12 (Cross References: 3.13, 3.17, 3.19, 3.4, 3.5, 3.60)

Sodium benzoate, while possessing only slight bacteriostatic action at or near the neutral point for fish flesh, has a beneficial effect in retarding trimethylamine formation. Sodium nitrite is considerably more effective than the nitrate, especially when used with fish having a pH of 6.0 or less. Use of sodium nitrite in concentrations not exceeding 200 micrograms per gram of fish is now legal in Canada and it is used considerably in the Canadian Maritime Provinces. A discussion of the mechanism of nitrite in preventing fish spoilage is presented.

Hydroxylamine retards bacterial spoilage both below and above pH 7. However, it possesses some undesirable cumulative toxic effects. Certain antibiotics possess bacteriostatic effects. Aureomycin and terramycin have the most potent action with chloromycetin having limited value.

Attempts have been made to preserve fish by storage in ices containing germicidal substances. Few of such compounds will freeze uniformly throughout the ice and hardly any have contributed a really significant improvement to the keeping quality of the fish stored therein. Of the compounds tested for such use, nitrites (used in 0.1% concentration) and aureomycin (1 to 4 micrograms per gram) have been most effective.

In smoked fish, probably the action of the salt used in preliminary brining and the dehydration which occurs during smoking are as important in producing preservation as any germicidal constituent of the smoke itself. Phenols and formaldehyde occur in the smoke; the former compounds are believed to possess some important bacteriostatic effect.

3.4 TREND TO MILDNESS SHIFTS SMOKERS TO FROZEN SALMON

Anonymous
Pacific Fisherman 52, No. 6, 57-59 (May, 1954)

The trend in cured fish today is away from the strongly salted items. Refrigeration, rather than salt, is depended upon for preservation. Two factors appear to be involved: (1) Growing consumer preference for the less salty product prepared from the frozen salmon; (2) Widely available refrigeration facilities and increasing knowledge of the technology of freezing, storing, and thawing.

Another important factor, from the standpoint of the producer, is that when frozen salmon are used the variables are reduced to the quality of the fish itself. He may apply his own ideas and formulas. In addition, there are many more sources of supply for frozen than for mild-cured fish. As a result, less mild-cured salmon is being smoked.

In general, the process of smoking frozen salmon is as follows: The frozen fish are thawed slowly in barrels or tanks of cold water. They are then split, as for mild curing, and the sides are sprinkled with a curing mixture whose composition varies with the invividual packer, but which generally contains some sugar as well as salt. The purpose of this step is to provide seasoning rather than preservation. After the sides have seasoned for a certain length of time, during which they have exuded a moderate amount of moisture, they are placed in two-story smoking ovens high above the fire.

In smoking salmon that has been frozen and not salted, the usual practice is to lay the sides on screens rather than to hang them from hooks, because the flesh is softer and the skin tender.

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 ABSTRACTER: Roy C. Stevens

2.08 FRESH STOCKFISH: ICING

Rowan, A. N.
Fishing Industry Research Institute (South Africa), Sixth Annual Report of the Director, 9-10 (March 31, 1953)

Icing of Fish for Rail Transport

Some of the fresh fish railed from Cape Town to other centers is sent in crates. The most generally used crate holds 200 lbs. of fish and about 140-150 lbs. of ice. These crates are generally packed by putting 40-50 lbs. of ice at the bottom, then putting in the fish and topping up with the rest of the ice. This method leaves the sides of the crate uniced and the block of fish is 3 to 4 layers thick without ice between the layers.

Tests were done in which crates iced as above were compared with crates in which 40-50 lbs. of ice were put at the bottom, 35-40 lbs. spread between the layers of fish and down the sides of the crate and about 60 lbs. put on top. Fish packed in this way were found to be in a noticeably better condition after 4 days' storage in the laboratory than fish packed without ice between the layers. It was found that the top and bottom layers of fish in both crates as well as the center layer in the test case cooled at about the same rate (75 minutes to cool from 35° F. -33° F.). The center fish in the control case took twice as long to cool (150 minutes from 35° F. -33° F.).

On balance it appears that the packing of fish with ice between the layers improves the final quality, but further commercial scale tests will be done next summer to verify this.

Storage of Iced Stockfish in Bulk

It was reported that fish railed to inland centers lost weight during the journey of 3-4 days.

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6.190 STORING OF HERRING AND MEAL. INFLUENCE ON NUTRITIVE VALUE

Laksevela, B.
Meldinger fra SSF, No. 2, 39-43 (March, 1954) (English summary, p. 45)

Feeding trials with chicks were used to compare the nutritive value of meals made from fresh herring, herring stored for 10 days without any preservative, herring stored for 31 days with 3% salt as a preservative, and herring stored for 32 days with 1% sodium nitrite as a preservative. These meals were compared (1) in diets with casein as a source of protein and (2) in diets having a sub-optimal protein content. All of the meals gave decidedly better chick growth than casein alone. Chicks receiving the meals made from fresh herring and from herring stored in different ways, however, showed hardly any difference in growth response. Meal made from the 3 percent salt-preserved herring stimulated chick growth to some extent. The growth stimulating effect of this meal, however, may have been due to the small amounts of salt that it contained.

Concentrated "fish solubles" from the aforementioned lots of herring, with the exception of the salt-preserved lot, also were fed to chicks. Chick growth on a basal diet containing crystalline cobalamin (B_{12}) was compared with growth on the basal diet supplemented with the following: (1) 3% yeast, (2) solubles from cooked and pressed fresh herring, (3) solubles from cooked and pressed 10-day-old herring, and (4) solubles from 32-day-old herring preserved with sodium nitrite. Each of the different solubles obtained from stored herring gave a better growth response than the solubles obtained from fresh herring. Microbiological synthesis of riboflavin and/or other growth factors may have been responsible for the additional growth response obtained with the solubles obtained from herring that had been held in storage.

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 ABSTRACTER: Martin Heerdt

6.190 STORAGE OF HERRING. INFLUENCE ON REPARTITION OF PROTEIN AND B-VITAMINS

Klungsoyr, M.; Boge, G.; and Johannessen, B.
Meldinger fra S.S.F., No. 2, 26-38 (March, 1954) (English summary, p. 45)

Ten-day-old herring stored without any preservative, 31-day-old herring stored with 3 percent salt as a preservative, and 32-day-old herring stored with one percent sodium nitrite as a preservative were compared with fresh herring. Each of the 3 methods of storage resulted in the loss of blood-water that contained about 3 percent of the protein content of the raw material. In every instance the blood-water contained more riboflavin, pantothenic acid, vitamin B_{12}, and niacin (calculated on a protein basis) than the presscake. Blood-water from old herring was about equal to glue-water as a source of vitamins. A considerable quantity of protein was lost to the glue-water, and this quantity increases when the herring are held in storage.

The riboflavin, pantothenic acid, vitamin B_{12}, niacin, and protein content of the raw material, the presscake, the blood-water, and the glue-water are compared in tables 3 and 4 (omitted). Table 4 also shows a balance of the total protein involved. Balance data for the riboflavin, pantothenic acid, vitamin B_{12}, and niacin are shown in tables 5-8 (omitted).

The total loss of vitamins to the blood-water is relatively insignificant in comparison with the total loss of vitamins to the glue-water. As much as 74 percent of the pantothenic acid and 40 to 50 percent of the vitamin B_{12} can be recovered by using the glue-water. On the basis of these two vitamins alone, there is considerable difference between ordinary meal and whole meal.

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 ABSTRACTER: Martin Heerdt

6.190 (Cross Reference: 3.14)

In a comparison of solubles from (1) cooked and pressed fresh herring, (2) cooked and pressed 10-day-old herring, and (3) varying amounts of crystalline B_{12}, each as supplements to a basal chick diet, only the solubles obtained from stored herring gave an improvement (slight) in chick growth.

6.190 (Cross References: 6.132, 3.14)

With the exception of riboflavin, the vitamin content of the presscake from the 3 differently stored lots of herring varied relatively little. A considerable increase in riboflavin was found in all instances in which the herring had been stored. This increase indicates a microbiological synthesis of riboflavin during storage.

3.4 (Cross Reference: 1.30)

A Los Angeles company uses an electrostatic smoker in which the sides are carried through a tunnel and the smoke is deposited on the fish as a result of opposite electric polarity.

More and more smoked fish production is being sliced and packaged for the consumer and the delicatessen or sandwich shop. A Brooklyn plant has a double packing line in which the smoked sides are sliced by machine and the slices conveyed along two stainless steel lines where women fill them into cans, top the cans with salad oil to exclude air and protect the fish against oxidation, and then send them to the closing machine.

2.08 (Cross Reference: 2.5)

These fish were bulk stacked to a height of 4-5 feet with ice between layers, and below and on top of the fish. It was thought that this loss of weight was due to the pressure on the fish at the bottom, and tests were carried out to find the effect of this pressure on the fish.

Stockfish were stored in ice, and trays containing heavy weights placed on top of the stack of fish and ice. The loss of weight after 3 and 7 days was determined.

The table below gives the results.

The bulk density of stockfish closely packed worked out at 48 lbs. per cubic foot. Using this figure together with those in the table below, the following equation was derived graphically between the daily loss of weight of a stack of fish and its depth.

$$x = 0.15 - \frac{h}{100}$$

where x = average daily change in weight of stockfish in a stack as a percentage of the original weight of the stack,
and h = height of stack of iced fish in inches.

The best line fitting the points of daily changes over 3 days differs in slope and intercept from that after 7 days, but when the differences were tested statistically they were found to be without statistical significance.

This equation is based on the assumption that the average loss of weight is found by using the pressure on the fish halfway down the stack as the average pressure on the fish. Thus the average daily loss of weight percent in a stack of iced fish 72" high = 0.57%. It will be seen that in single or double layers of fish (height less than 15") there is actually a gain in weight according to the above formula. This is in line with the experimental findings.

Pressure on top of fish (lb. sq. ft.)	Equivalent Depth of stack of fish to produce this average pressure (inches)	change in weight of fish per day as a % of original weight of fish	
		After 3 days in ice	After 7 days in ice
0	0	- 0·53	- 0·26
0	0	- 0·12	- 0·12
11	2·7	- 0·06	- 0·06
11	2·7	- 0·11	- 0·07
163	40·7	0·69	- 0·72
172	43	- 0·54	0·81
185	46·2	- 1·01	0·75
194	48·5	- 1·07	- 0·89
275	68·7	- 0·96	- 0·89
297	74·2	- 1·05	- 1·01
310	77·5	- 1·55	- 1·37
332	83	- 1·53	- 1·28

3.23 HANDLING SHRIMP IN THE BREADING PLANT

Duggan, J. Roy
Southern Fisherman Yearbook, 62-64 (March 31, 1954)

It is estimated that there are well over a hundred different brands of breaded shrimp and that from 25 to 40 percent of all shrimp production is now going through the breading plants.

Shrimp arriving at the breading plant are washed, inspected, and graded for size in the same manner as those destined for direct freezing. From the graders, the shrimp are carried on rubber conveyors to hanging scales that accumulate 100 pounds of shrimp. From the scales, the shrimp are re-iced, and each 100 pound box gets a receiving tag showing the count, lot number, and date received. The shrimp may be processed immediately or they may be held in a cooler for later processing. At this point, it is decided what the final end product of the various sizes will be. This might be round or butterfly breaded shrimp, individually frozen peeled and deveined shrimp, cooked shrimp, or frozen fresh. A batch number is assigned to each lot, and this batch record follows through all stages of processing.

The shrimp are peeled and deveined by hand from small, iced containers. Each worker's station is equipped with a continuous jet of cold running water so that the shrimp can be peeled, cleaned, and washed at the same time. The shrimp are again placed in ice in readiness for the breading process.

The breading batter should be kept as cold as possible in order to retard bacterial action. A uniform quantity -- neither too much nor too little -- should be added to the shrimp. Methods of applying the breading vary with each individual plant and none is described by the author. After

(over)

 ABSTRACTER: Roy C. Stevens

3.33 HANDLING SHRIMP IN THE CANNING PLANT

Robinson, H. R.
Southern Fisherman Yearbook, 65-66, 125 (March 31, 1954)

Shrimp received at the cannery are washed and de-iced, inspected along a conveyor belt, and weighed before going to the peelers. Peeling may be accomplished either by hand or by machine. In the author's plant, following picking, the shrimp pass over inspection belts for a final quality check of the raw shrimp. They are then graded for size, and the larger shrimp are deveined.

The next step in the canning procedure involves the blanching of the shrimp. This accomplishes three things: (1) the curling of the shrimp, (2) the extraction of water and solubles from the shrimp, and (3) a change of color from the natural pigmentation to a pink color. Cooking time and strength of solution are critical in this operation from the standpoint of final quality.

Following the blanch, the shrimp are graded and cooled -- cooling occurring both before and after the grading operation. Grading is generally done mechanically, most firms using vibrating graders. After grading, the shrimp are carefully inspected for bits of hulls and other extraneous matter.

The shrimp are then packed into cans by hand, each can being filled to an exact weight in order to meet a drained weight requirement established by a Federal Standard of Fill of Container. Following the packing operation, the cans are conveyed to the closing machine. Before entering the closing machine, hot brine, or hot water and a salt tablet, is added to the cans.

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 ABSTRACTER: Roy C. Stevens

0.5 BACTERIOLOGICAL TESTS ON ICE AND HARBOUR WATER

Rowan, A N.
Fishing Industry Research Institute (South Africa), Sixth Annual Report of the Director, 10-11 (March 31, 1953)

Samples of water were taken in sterile collecting bottles (as described by Zobell -- Marine Microbiology, page 29, sampler E) from the surface, from 8 ft. down, and at the bottom, i. e., 16 ft. below the surface. The samples were taken 3 ft. from a quay in the Fishery Harbour, Cape Town Docks.

Samples were plated on nutrient agar and stored at room temperature (± 21°C.) and at 37°C. Counts were made of the total number of colonies which developed.

The following table gives the average number of organisms found per c. c. after 5 days' incubation.

	Incubated at 21°C.	37°C.
Surface	13,500	7,000
Mid Water	1,800	3,000
Bottom	2,300	3,000

In addition presumptive coliform counts incubated at 37°C. were done on all samples and were all found to be over 180 coliforms per 100 ml. As in fishery harbours elsewhere in the world, this water therefore is too badly polluted to be used for washing fish or equipment.

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 Reprinted in whole

3.231 THE JACKET PRINCIPLE...IN CANADIAN COLD STORAGE

Young, O. C. (Fisheries Research Board of Canada, Ottawa)
Canadian Refrigeration Journal, 2-4 (November, 1952)

Frozen fish that are stored for extended periods in the "orthodox" cold rooms (rooms refrigerated by cooling coils on the ceiling) are subject to degradation in quality through dehydration and through increased oxidation resulting from the loss of protective coatings such as glazes. This drying effect in a cold room is dependent upon such factors as the area exposed to wide temperature differences, the area of the cooling surface exposed in the room, the thickness of insulation, and the actual constructional design. Until recently, little effort has been made to reduce dehydration through improvements in structural design. Studies conducted by the Fisheries Research Board of Canada -- at the Halifax Station in 1927, at St. Andrews, New Brunswick in 1929, and on the West Coast in 1931 and 1932 -- showed that the drying effect could be greatly reduced by jacketed cold storage rooms. However, this principle has not come into general use until comparatively recently.

With the cooperation of a few plant operators, many ideas on jacketing were applied that resulted in useful designs for the reduction of drying in the orthodox type of cold room. Several types are described here.

In figure 2 (this card, over) the double jacket is arranged so that the cold air from the ceiling coils descends within the inner jacket; at the bottom of the outer duct the circulating air begins to pick up heat from the warm wall and rises due to reduced density. It is important that the outer jacket be carried up to the level of the cooling coils and that the inner jacket be somewhat lower than this. The latter should offer the least possible resistance to the descending cold air.

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 ABSTRACTER: D. T. Miyauchi

0.5 (Cross Reference: 2.01, 2.08)

In samples drawn at various depths from the surface to 20 feet below the surface in the open sea 50 miles off Cape Columbine, no coliform organisms were found. According to Zobell (ibid, p. 60) the open ocean 4 or more kilometres from land generally contains less than 250 bacteria per ml.

3.231

In figure 3 (below), the double jacket is extended over that portion of the floor that is warm and over the warm wall and is designed to provide the shortest path for the air circulating through both jackets.

In figure 4 (below), where all the walls and floor are warm, the circulation of air is as indicated. The broken line shows how the fish may be piled so as to funnel the air into the inner duct.

Figure 5 (below) shows diagramatically the jacket principle as applied to a cold room using mechanical rather than natural air circulation to increase efficiency.

Although there are only a few plants in Canada in which the jacket principle is applied throughout, these plants are getting such favorable results that it is believed that the principle will be applied in more plants that will be built in the future to store frozen fish in the bulk.

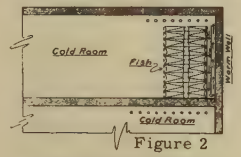

Figure 2

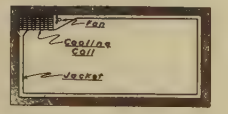

Figure 5.

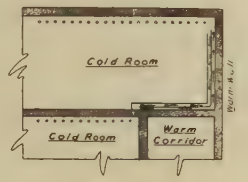

Figure 3.

Figure 4.

3.23 (Cross Reference: 1.85)

packing in either retail or institutional size cartons, the shrimp should be moved into the freezing cycle as soon as possible.

The importance of sanitation and temperature control are stressed through all stages of processing, holding, and distribution.

3.33 (Cross Reference: 1.85)

Processing time is determined by the initial temperature of the product; that is, the average temperature of the contents of the coolest cans going into the process. The liquid added to the can should be at a temperature not less than 200° F. and the can should be sealed immediately to insure a good vacuum. In order to reduce the length of time of processing, the sealed cans should move to the process as quickly as possible, with a maximum delay not exceeding 30 minutes.

On completion of the actual processing, the canned shrimp should be completely cooled immediately.

0.8 DESALTING SEA WATER

Anonymous
Chemical and Engineering News 32, No. 17, 1666 (April 26, 1954)

Two major contracts and 3 exploratory contracts for research in the development of practical processes for conversion of salt water to potable water have been signed by the Department of the Interior.

The first contract is for compression distillation equipment radically different from existing equipment being used aboard ship. The proposed equipment has no boiler tubes, high heat-exchange capacity and heat conservation, 5 times the capacity of existing equipment, and operates under vacuum, with low temperature differentials between evaporation and condensation. It is believed that the high heat-exchange rates of this equipment will lower the cost of desalting sea water to one-fourth of the present costs.

The second contract is for a field process based on ion exchange and is an outgrowth of an earlier contract on the use of electrical membranes for desalting brackish water. The present contract calls for a unit having 10 times the capacity of the previous pilot-plant equipment. The first nine months of test operation will be carried out in central Arizona on highly mineralized saline water for the removal of salt. The treated water, after being diluted with fresh water, will be used for irrigation. Ion exchange equipment also will be used to reduce the high mineral content of the drinking water being supplied to a South Dakota municipality. A third field test will be made with brackish municipal and irrigation waters of the lower Rio Grande area.

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 ABSTRACTER: Martin Heerdt

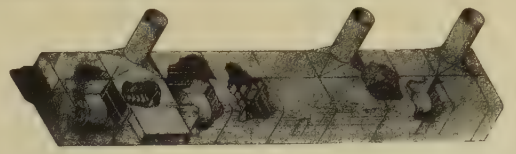
3.7 IT DRYS WITHOUT HEATING

Anonymous
Chemical and Engineering News 32, No. 16, 1622 (April 19, 1954)

A dryer recently offered for sale produces air having a low relative humidity by dehumidification rather than by raising the temperature of the air. The essential parts incorporated in the dryer are dehumidification units, air distribution units, conveying equipment, and a heat exchanger system. The dryer reportedly has been designed for handling temperature-sensitive materials such as gelatin, glue, soap, and pharmaceuticals.

Dryers are available in standard sizes ranging from 100 lb./hr. to 2000 lb./hr.; one particular model is presently producing 400 lb./hr. of commercial-grade (10 percent moisture content) gelatin or glue.

The material flow in the cut away diagram of the dryer shown below is from left to right. The moist air is vented through stacks leading from the dryer.



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 ABSTRACTER: Martin Heerdt

3.14 PRESERVATION OF OFFAL WITH FORMALIN

Rowan, A. N.
Fishing Industry Research Institute (South Africa), Sixth Annual Report of the Director, 11 (March 31, 1953)

Various samples of trawler offal were drawn during the year and analysed into their constituents. It was found that 60% of the offal consisted of small or broken stockfish and 15% of stockfish heads. The rest consisted of John Dory, rattail, dogfish, squid, octopus and starfish.

The preservative effect of formalin was tested by adding it to minced samples of fresh offal to make the final concentrations of formaldehyde in the offal 0.1, 0.2, and 0.4%. After 5 days' storage at a temperature of 68° F. - 70° F. it was found that the control and sample with 0.1% formaldehyde were stinking and liquefied. The 0.2% sample was slightly "off" and the 0.4% sample smelt only of formalin.

The samples were dried for 5 hours in a dehydrator at 150° F. and the total protein determined.

It was noted that the protein (6.25 x N as determined by the Kjeldahl method) in the fish meal made from the mince containing 0.2% and 0.4% formaldehyde was lower than in the untreated fish meal by amounts varying from 2.5% to 5.7%. In one test in which 0.1% formaldehyde was added the protein was 0.5% higher than in the control.

Lovern and Godden (Journal of the Science of Food and Agriculture, 1950, No. 10, pp. 314-316) state that 0.4% of formaldehyde by weight is a satisfactory preservative for fish guts and the above findings agree with their statement. In their analyses of the meals made from preserved fish guts

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 Reprinted in whole

2.08 HOLDING FRESH SHRIMP IN REFRIGERATED SEA WATER

Higman, J. B.; Idyll, C. P.; and Thompson, James (Marine Laboratory, University of Miami)
Southern Fisherman Yearbook, 95 (March 31, 1954)

Previous experiments by the authors demonstrated the value of refrigerated sea water for holding fresh shrimp aboard fishing vessels. Shrimp held in sea water chilled to 29° - 32° F. were superior from the standpoint of flavor and appearance to those held in crushed ice. Melanosis, or black spotting, was eliminated. However, the method had a weakness in that undesirable odors developed in the sea-water-held shrimp.

Several methods have since been tried in an effort to eliminate odor. No improvement in quality resulted from changing various volumes of the refrigerated sea water. The addition of sodium hypochlorite, calcium hypochlorite, sodium bisulfite, a patented mixture of fumaric acid and sodium benzoate, and a patented colloidal suspension of silver had no effect.

Experiments were conducted in which 1, 5, 8, 10, and 20 p.p.m. of aureomycin hydrochloride were added to the refrigerated sea water in which freshly-caught shrimp were being held. Tests comparing the treated samples with untreated controls held in refrigerated sea water were conducted at intervals. A 5-point scale was used in rating the shrimp as to taste, odor, and toughness. Aureomycin-treated shrimp produced scores for taste and toughness slightly higher than the scores for untreated shrimp, but these differences were not great enough to be statistically significant. Concentrations of aureomycin below 5 p.p.m. were ineffective in eliminating the undesirable odor. The 10 and 20 p.p.m. concentrations inhibited the odor, but caused a slight yellowish coloration on the shrimp muscle.

(over)

 ABSTRACTER: Roy C. Stevens

DESALTING OF SEA WATER

PRESERVATION OF OFFAL WITH FORMALIN

LOW TEMPERATURE DRYER

HOLDING SHRIMP IN COOLED SEA WATER

3.14

the crude protein was lower in the 0.2% and 0.4% formaldehyde samples and higher in the 0.1% sample than in untreated guts.

Thus the work reported above confirms Lovern and Godden's findings on the preservative action of formalin in offal and the protein contents of the treated and untreated offal fall into line with the trend of the figures given by them in their table No. II.

Further work is contemplated in order to elucidate the causes of the difference in protein analyses between the controls and treated samples.

2.08 (Cross Reference: 1.85)

The possible effect on quality of different sizes of ice particles was investigated, but no measurable differences dould be detected.

Tests were also conducted in attempts to reduce melanosis, or black spotting, of shrimp held in ice. Ascorbic acid and sodium bisulfite were tested. The ascorbic acid was ineffective, but promising results were obtained with sodium bisulfite in concentrations of 1, 2.5, and 5 percent. Best results were obtained with the 2.5 percent solution. Shrimp dipped for about one minute in the sodium bisulfite solution aboard the fishing vessel before stowing in ice, and again after 7 to 8 days, showed marked reduction in the amount of melanosis after being held on ice.

0.8

The third contract calls for exploration of the possibilities of using critical temperatures and pressures for sea water distillation and requires that corrosion and scaling problems be overcome.

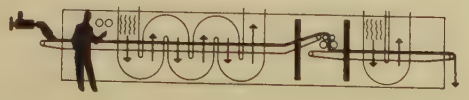
The fourth contract calls for exploration of a membrane demineralization process (ion exchange) that would be capable of separating minerals on a selective basis in contrast to the aforementioned ion exchange process that removes all salts regardless of type.

A fifth contract calls for the development of a low-cost solar distillation apparatus through the use of plastic materials.

Other projects include expanded solar distillation studies, separation of salt from water by freezing, and work on separation by osmosis and solvent extraction. Other ideas that may further reduce the cost of desalting water are needed.

3.7 (Cross Reference: 6.134)

In the flow diagram shown below, material is extruded in the form of lacerated strips and distributed uniformly on a conveyor belt. Vertical streams of air pass through the material as it travels along the conveyor. Two-thirds of the way through the dryer the semi-dried strips are restacked on a second conveyor. Additional vertical streams of air complete the drying process and the product is now ready for grinding.



0.31 NATURAL RESOURCES OF CHOLESTEROL. I. STEROL IN SEI-WHALE BRAIN

Komori, Saburo and Morita, Ei
J. Chem. Soc. Japan, Ind. Chem. Sect. 54, 413-14 (1951)
Chemical Abstracts 47, No. 11, 5627 (1953)

It has been found that the dried brain of sei-whale contains 12.9% free cholesterol. The C_6H_6 ext. of the brain contains a large amt. of lipides and unsaponifiable matter. By the recrystn. of the latter from MeOH, 38.5% cholesterol is obtained.

0.38 STUDIES ON THE FATTY ACID OXIDIZING SYSTEM OF ANIMAL TISSUES. V. UNSATURATED FATTY ACYL COENZYME A HYDRASE

Wakil, Salih J. and Mahler, R. H.
Journal of Biological Chemistry 207, No. 1, 125-132 (March, 1954)

0.39 MECHANISM OF HYDROLYSIS OF ADENOSINETRIPHOSPHATE CATALYZED BY LOBSTER MUSCLE

Koshland, D. E. Jr. and Clarke, Edith
Journal of Biological Chemistry 205, No. 2, 917-24 (December, 1953)

The hydrolysis of adenosinetriphosphate catalyzed by washed lobster muscle strips was studied in O^{18}-labeled water.

1.0118 COMPOSITION OF CERTAIN SPECIES OF FRESH-WATER FISH. I. INTRODUCTION: THE DETERMINATION OF THE VARIATION OF COMPOSITION OF FISH

Stansby, M. E.
Food Research 19, No. 2, 231-234 (March/April, 1954)

(Abstract of this article appears under 7.0 page 3)

1.0142 ANNUAL REPORT OF THE FISHERIES EXPERIMENTAL LABORATORY FOR 1953

Anonymous
Annual Report of the Fisheries Experimental Laboratory for 1953, Denmark (1954) 31 pp.

(Abstract of this article appears under 0.6 page 1 - May, 1954 issue)

1.017 AUSTRALIAN TAIL EXPORTS TO U. S. NEAR FOUR MILLION POUNDS

Anonymous
Quick Frozen Foods 16, No. 9, 93-94 (April, 1954)

(Abstract of this article appears under 1.87 page 5)

1.85 HOLDING FRESH SHRIMP IN REFRIGERATED SEA WATER

Higman, J. B.; Idyll, C. P.; and Thompson, James
Southern Fisherman Yearbook, 95 (March 31, 1954)

(Abstract of this article appears under 2.08 page 19)

1.85 HANDLING SHRIMP IN THE BREADING PLANT

Duggan, J. Roy
Southern Fisherman Yearbook, 62-64 (March 31, 1954)

(Abstract of this article appears under 3.23 page 17)

1.85 HANDLING SHRIMP IN THE CANNING PLANT

Robinson, H. R.
Southern Fisherman Yearbook, 65-66, 125 (March 31, 1954)

(Abstract of this article appears under 3.33 page 17)

1.85 HANDLING SHRIMP IN THE PACKING AND FREEZING PLANT

Strasburger, L. W.
Southern Fisherman Yearbook, 58-61 (March 31, 1954)

(Abstract of this article appears under 3.230 page 9)

1.85 USE OF CHILLED SEA WATER AND DILUTE BRINES IN PLACE OF ICE FOR HOLDING SHRIMP ABOARD A FISHING VESSEL

Roach, S. W. and Harrison, J. S. M.
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 98, 23-24 (April, 1954)

(Abstract of this article appears under 2.19 page 1)

1.85 NEW GLAZE METHOD CUTS SHRIMP PACKING COSTS

Anonymous
Quick Frozen Foods 16, No. 9, 106 (April, 1954)

(Abstract of this article appears under 3.238 page 1)

2.01 STUDIES ON PUTREFACTION OF AQUATIC PRODUCTS. VII. ON UREA-SPLITTING BACTERIA IN SHARK MUSCLE

Simidu, Wataru and Hibiki, Sigeyuki
Bulletin of the Japanese Society of Scientific Fisheries 19, No. 3, 159 (1953) (English summary and figures)

" Shark muscles cooked at above 55°C. followed the putrefaction curve common to fishes in place of the ammonia-developing curve characteristic of the shark. Ammonia was generated however from the cooked muscle when it was infected with several kinds of urea-splitting bacteria separated from the shark or a salted fish."

2.01 BACTERIOLOGICAL TESTS ON ICE AND HARBOUR WATER

Rowan, A. N.
Fishing Industry Research Institute (South Africa), Sixth Annual Report of the Director, 10-11 (March 31, 1954)

(Abstract of this article appears under 0.5 page 17)

2.01 TOXICITY OF AMINES FOR BACTERIA

MacLeod, R. A. and Onofrey, Eva
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 98, 22-23 (April, 1954)

(Abstract of this article appears under 3.12 page 9)

2.02 MICROBIOLOGICAL DETERIORATION OF FISH POST MORTEM, ITS DETECTION AND CONTROL

Tarr, H. L. A.
Bacteriological Reviews 18, No. 1, 1-15 (March, 1954)

(Abstract of this article appears under 2.01 page 13)

2.02 RIGOR MORTIS IN BEEF

Marsh, B. B.
Journal of the Science of Food and Agriculture 5, No. 2, 70-75 (February, 1954)

The changes in pH and adenosine triphosphate (ATP) content accompanying the physical manifestations of rigor mortis in the longissimus dorsi muscle of the ox are described. As in rabbit muscle, the development of inextensibility accompanies the dephosphorylation of ATP, and, provided the ultimate pH is low, the fall in pH runs parallel to these changes.

2.08 BACTERIOLOGICAL TESTS ON ICE AND HARBOUR WATER

Rowan, A. N.
Fishing Industry Research Institute (South Africa), Sixth Annual Report of the Director, 10-11 (March 31, 1954)

(Abstract of this article appears under 0.5 page 17)

2.12 LIVE BAIT FISHING FOR TUNA IN THE CENTRAL PACIFIC

Ikehara, Isaac I.
Special Scientific Report: Fisheries No. 107, U. S. Fish and Wildlife Service, July 1953, 20 pp.

(Abstract of this article appears under 1.1 page 7 - June, 1954 issue)

2.12 NORTH PACIFIC ALBACORE TUNA EXPLORATION, 1952

Schaefers, Edward A.
Commercial Fisheries Review 15, No. 9, 1 (September, 1953)

2.14 MARINE ELECTRICAL FISHING

Dickson, W.
World Fishing 3, No. 4, 148-151 (April, 1954)

The nature of electric fields in a conducting medium is dealt with briefly because of the importance of this theoretical background in electrical fishing. A comparison is made between the power requirements in fresh and salt water. Some electrical background is given so that the engineering problems set by electrical fishing in the sea may be appreciated and given a historic perspective. Pulse shapes, durations and recurrence frequencies are considered. Reference is made to electrical fishing equipment produced in Germany. A skeleton circuit and the significant wave-apparatus being developed in the United Kingdom are given and their implications briefly discussed.

2.19 HANDLING SHRIMP ABOARD VESSELS AND AT THE DOCK

Pinson, Pedro L.
Southern Fisherman Yearbook, 54-57 (March 31, 1954)

(Abstract of this article appears under 1.85 page 5)

2.19 INVESTIGATION OF THE SOURCE OF AN OFFENSIVE ODOUR IN A SHIPMENT OF GRAY COD

Boyd, J.; Brumwell, C.; and MacLeod, R. A.
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 96, 20-21 (October, 1953)

(Abstract of this article appears under 2.00 page 11 - March, 1954 issue)

2.19 USE OF CHILLED SEA WATER IN PLACE OF ICE IN TRANSPORTING FISH

Lantz, A. W.
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 95, 39-44 (July, 1953)

(Abstract of this article appears under 2.08 page 3 - December, 1953 issue)

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Biochemical Journal
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Bulletin of the Japanese Society of Scientific Fisheries
California Fish and Game
Canadian Fisherman
Canadian Journal of Chemistry
Canadian Journal of Technology
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Fish. Res. Bd. Can., Prog. Repts. Pacific Coast Stas.
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Journal of Home Economics
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Journal of the American Chemical Society
Journal of the American Dietetic Association
Journal of the American Oil Chemists' Society
Journal of the Association of Official Agricultural Chemists
Journal of the Fisheries Research Board of Canada
Journal of the Science of Food and Agriculture
Maine Coast Fisherman
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Modern Packaging
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National Provisioner
Nature
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Pacific Fisherman
Pan American Fisherman
Poultry Science
Practical Home Economics
Progressive Fish-Culturist
Quick Frozen Foods
Refrigerating Engineering
Report of the Food Investigation Board (Great Britain)
Science
Southern Fisherman
Trade News (Fisheries Department, Canada)
Western Fisheries
World Fishing

Articles chosen for abstracting or inclusion as bibliographical references are those deemed of interest to the commercial fisheries and to fishery technological laboratories. Occasionally pertinent articles from sources other than the above listed publications are included. Biological papers are generally omitted.

3.14 STORING OF HERRING AND MEAL. INFLUENCE ON NUTRITIVE VALUE

Laksevela, B.
Meldinger fra SSF, No. 2, 39-43 (March, 1954)

(Abstract of this article appears under 6.190 page 15)

3.14 STORAGE OF HERRING. INFLUENCE ON REPARTITION OF PROTEIN AND B-VITAMINS

Klungsoyr, M.; Boge, G.; and Johannessen, B.
Meldinger fra SSF, No. 2, 26-38 (March, 1954)

(Abstract of this article appears under 6.190 page 15)

3.14 PRODUCTION OF HERRING MEAL

Various authors
Meldinger fra SSF, No. 1, 12-21 (January, 1954)

(Abstract of this article appears under 6.132 page 13 - June, 1954 issue)

3.19 MICROBIOLOGICAL DETERIORATION OF FISH POST MORTEM, ITS DETECTION AND CONTROL

Tarr, H. L. A.
Bacteriological Reviews 18, No. 1, 1-15 (March, 1954)

(Abstract of this article appears under 3.12 page 13)

3.19 SOME FUNDAMENTALS OF RADIATION STERILIZATION

Robinson, Radcliffe F.
Food Technology 8, No. 4, 191-194 (April, 1954)

3.19 RELATIVE BACTERICIDAL EFFICIENCIES OF THREE TYPES OF HIGH-ENERGY IONIZING RADIATIONS

Goldblith, S. A.; Proctor, B. E.; Davison, S.; Kan, B.; Bates, C. J.; Oberle, E. M.; Karel, M.; and Lang, D. A.
Food Research 18, No. 6, 659 (November/December, 1953)

4.0 ANIMAL FATS: RECENT RESEARCHES IN THE FATS RESEARCH LABORATORY, D.S.I.R., NEW ZEALAND

Shorland, F. B.
Journal of the Science of Food & Agriculture 4, No. 11, 497 (November, 1953)

4.21 REACTIONS OF FATTY MATERIALS WITH OXYGEN. XV. FORMATION OF 9, 10-DIHYDROXYSTEARIC ACID AND CLEAVAGE PRODUCTS IN THE ODIXATION OF OLEIC ACID AND METHYL OLEATE IN ACETIC ACID

Knight, H. B.; Jordan, E. F.; Koos, R. E.; and Swern, Daniel
Journal of the American Oil Chemists' Society 31, No. 3, 93-96 (March, 1954)

4.92 STUDIES ON THE NUTRITIVE VALUES OF LIPIDS. VIII. NUTRITIVE VALUE OR TOXICITY OF HIGHLY UNSATURATED FATTY ACIDS (1)

Kaneda, Takashi and Ishii, Seinosuke
Bulletin of the Japanese Society of Scientific Fisheries 19, No. 3, 171 (1953) (English summary, tables and figures)

"Rats took the feed prepared with the unoxidized highly unsaturated acids without showing any distaste. Rats fed diets containing the same highly unsaturated acids but oxidized under room temperature all died."

6.3 FURTHER STUDIES ON GROWTH FACTORS FOR STREPTOCOCCUS FAECALIS AND LEUCONOSTOC CITROVORUM IN MARINE ALGAE

Ericson, L. E.
Archives of Chemistry (Sweden) 6, No. 48, 503-510 (December 14, 1953) (In English)

6.3 FOOD FROM SEA PRODUCTS CONTINUE EXPANSION

Anonymous
Journal of Agricultural & Food Chemistry 2, No. 9, 447 (April 28, 1954)

6.3 STUDIES ON COLLOIDAL EQUILIBRIUM IN DILUTED ALGIN SOLUTION. II. VOLUME CONSTRICTION OF SODIUM ALGINATE SOLUTION

Kato, Kenji
Bulletin of the Faculty of Fisheries, Hokkaido University 4, No. 1, 82-85 (May, 1953)

"The volume constrictions of diluted algin solution were 26-30 cc. in the gel state and 50-60 cc. or over in the sol, owing to the presence of a molecule of Na-uronate monomer which polymerized into the algin molecule."

IMT.-DUP. SEC., WASH., D.C. 62215

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